the OIL AND GAS JOURNAL

MAY 9, 1955

How much current do you need to

STOP THAT CASING CORROSION?

Page 109

POLYETHYLENE—A growing giant outstrips its markets . Page 80

IRAN'S OIL—Nine companies divide last 5 per cent interest . Page 82

Where Mission makes the difference

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PAGE 1 ONE . . . *a glance ahead*

Chemistry is fast entering the water-flood business. Operators have discovered that simply putting water into an oil sand won't always recover much oil. Impurities react underground, clog the sand, bypass oil. Intensive work now being done on water treatments, additives, detergents to scour formations more effectively.

Big demand for asphalt can be expected from new highway-building program and trend toward bituminous paving instead of concrete. Should improve markets for residuals by refineries equipped to produce and promote asphalts of desired specifications.

Renewed interest in more research on synthetic liquid fuels is growing in some government circles. Thought is to keep technology up to date for defense emergency use; also that another decade may bring economic need for oil from coal and shale.

Prospects look dim for complete freedom from regulation for gas sales to interstate pipelines. Consumer witnesses have raised such a specter of fast-rising prices that Congress probably will include a curb on escalation clauses if it passes Harris bill.

Crude allowables will be cut further despite any achievement in voluntary reduction of imports, due to seasonal spring decline in demand. Even if imports are brought down to 1954 level the impact of the reduction will not be reflected in U. S. production for several months.

Legislation to authorize gas-pipeline companies to condemn sites for underground storage is not as hot an issue as it once was. Most producers and landowners will now approve it if there are safeguards for any indigenous oil or gas found in the reservoir.

The OIL AND GAS JOURNAL

MAY 9, 1955 • VOLUME 54 • NUMBER 1

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EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

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TECHNOLOGY—OPERATION

More Current Required for Cathodic Protection of Well Casing 109

By Dr. Leendert de Witte

Five amperes of cathodic protection current is not sufficient to protect deep well casing under corrosive conditions. Studies have been made of fields in Ventura County, California, during 5 years of cathodic protection. Checking of the average corrosion rate during this time would have required 20 to 30 times as much current.

How Temperature Affects Oil-Gas Separation 117

By Dr. John M. Campbell

In general low temperatures increase effectiveness of lease oil and gas separation. These rules of thumb are useful: (1) when gas is salable and stock-tank fluid is sold as crude, amount of liquid is usually optimum between 15° and 30° F.; (2) on leases producing less than 2 M.M.c.f.d., return per dollar of investment generally is greater at 40° to 60° F.; (3) refrigeration is seldom justified below —15° F.; and (4) separation above 85° F. is seldom justified.

Indoil Chemical Co. Makes First Shipment of Isooctyl Alcohol 119

Carbon Black By the Lynn Furmatic Process 120

By W. H. Balka

The Lynn process is a dry-furnace method for producing carbon black. Actual plant costs are about 30 per cent less per pound of carbon black recovered than conventional furnace-type plants. The plants will as a rule be amortized in a little better than a year.

Houdresid Converts Crude Residua Into Profitable Products 123

By J. C. Dart, G. A. Mills, A. G. Oblad, and C. C. Peavy

The Houdresid catalytic-cracking process has been developed to handle heavy residual fuels as charge stock. It is a new moving-bed process for converting a wide range of feed stocks into high-quality distillates. The process utilizes either natural or synthetic catalysts, and the equipment required is similar in many respects to that employed in conventional catalytic cracking. The process has been tested at Sun Oil's Sarnia refinery since March 1954.

Water Flood Ups Production Sharply 126

Drilling Is Cheaper and Faster in West Texas' Midland Farms 127

By Edwin McGhee

Stanolind set a new drilling pattern for West Texas when it needed only 56 days to reach 12,700 ft. in its latest well in Midland Farms Ellenburger field. Most of the saving in time and money was due to the drilling-fluid practice. Water is the drilling fluid on much of the hole. This combined with higher bit weights makes drilling faster.

New Pipeline Pipe 130

By A. B. Wilder

One of the new developments in the pipeline industry is production of seamless cold expanded pipe in sizes 16 to 26-in. o.d. Another new development in line pipe is T-1 brand steel.

Pipeline Patrol 152

Standard Oil of California's Rio Bravo 50-year-old pipeline station gets modern controls; a method for easier removal of unloader relief valves; big new crawler for pipeline work packs 230 hp. at the drawbar; other operating ideas.

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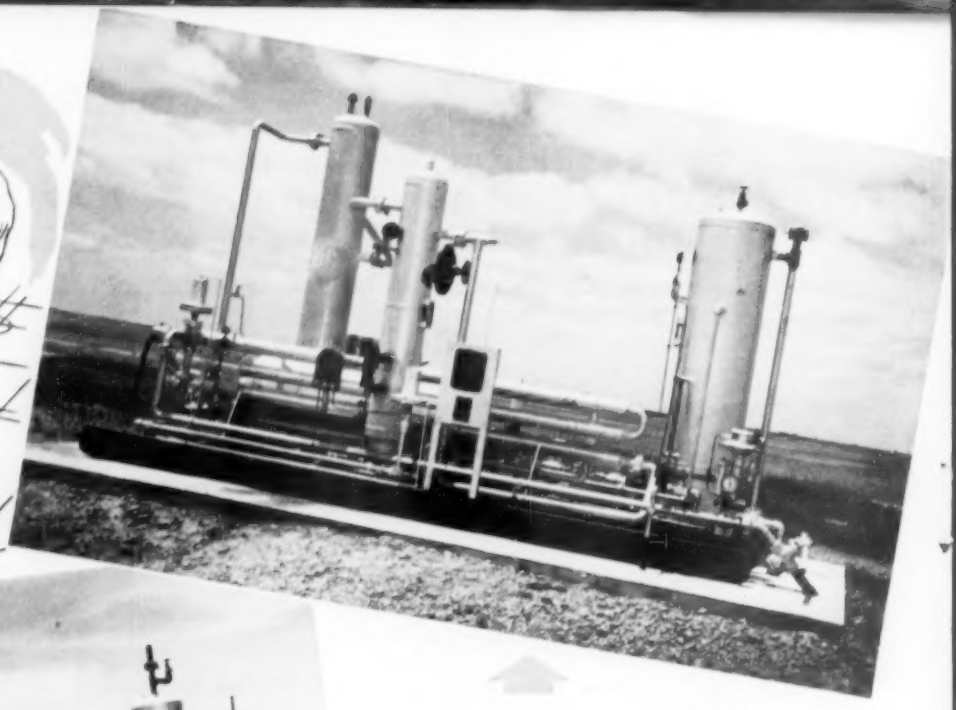
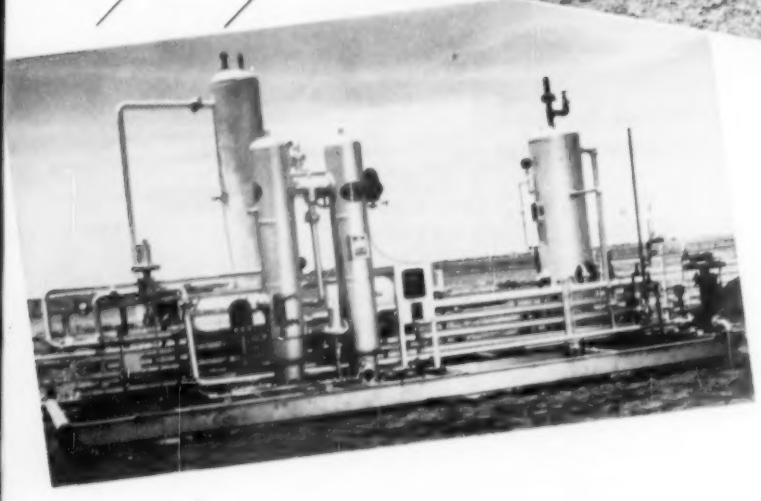


Example of a "custom-built" Parkersburg Hyreco. This 5MMCF unit, 3000 p.s.i. uses the single vertical knockout to meet processing requirements.



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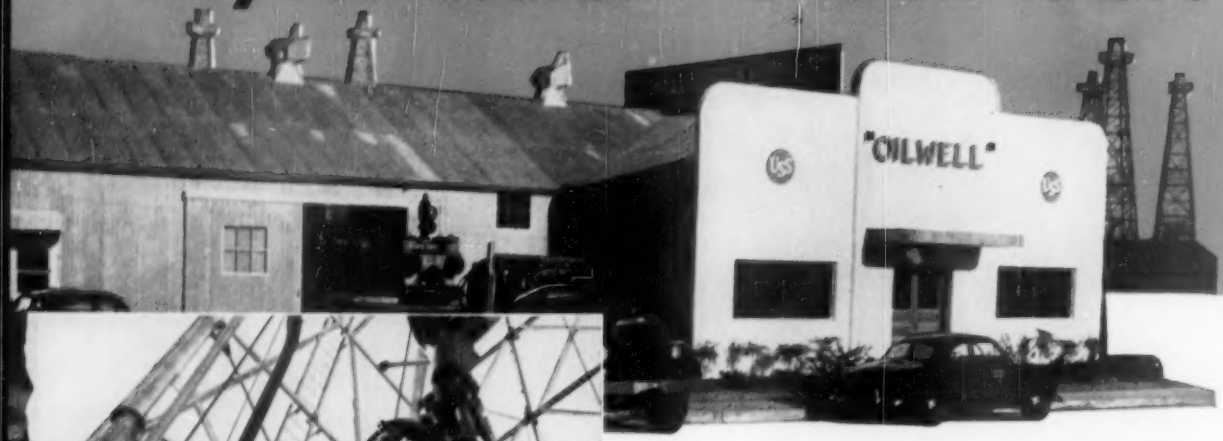

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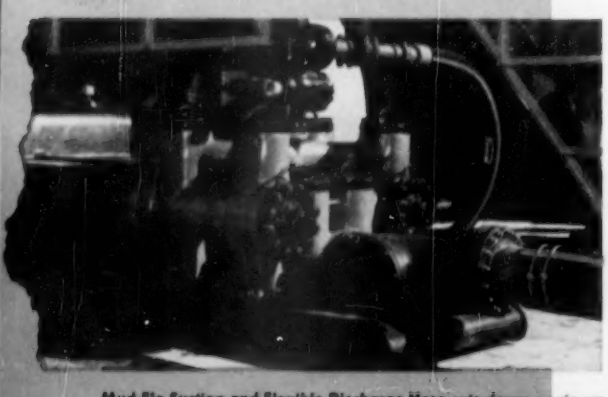

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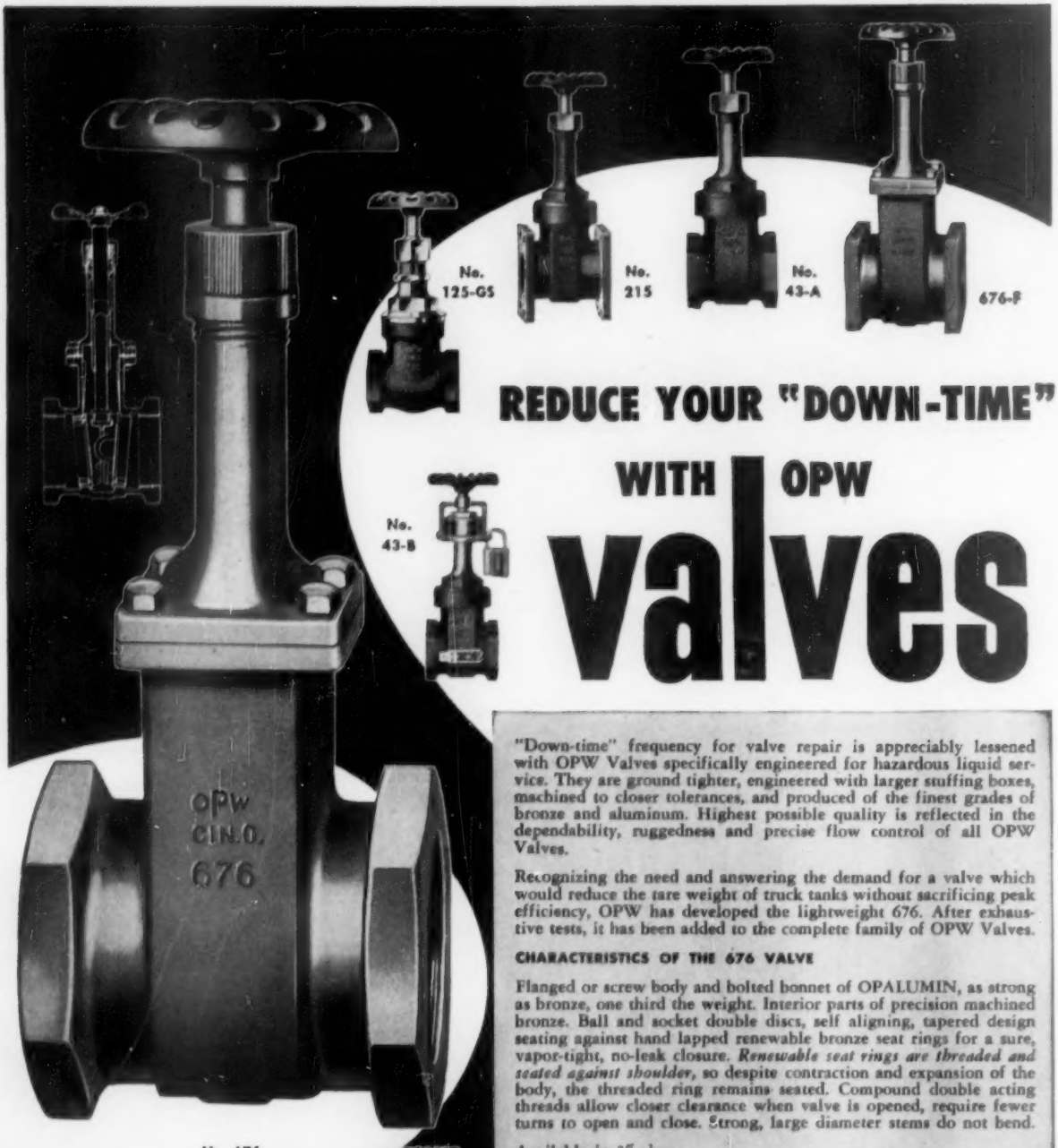

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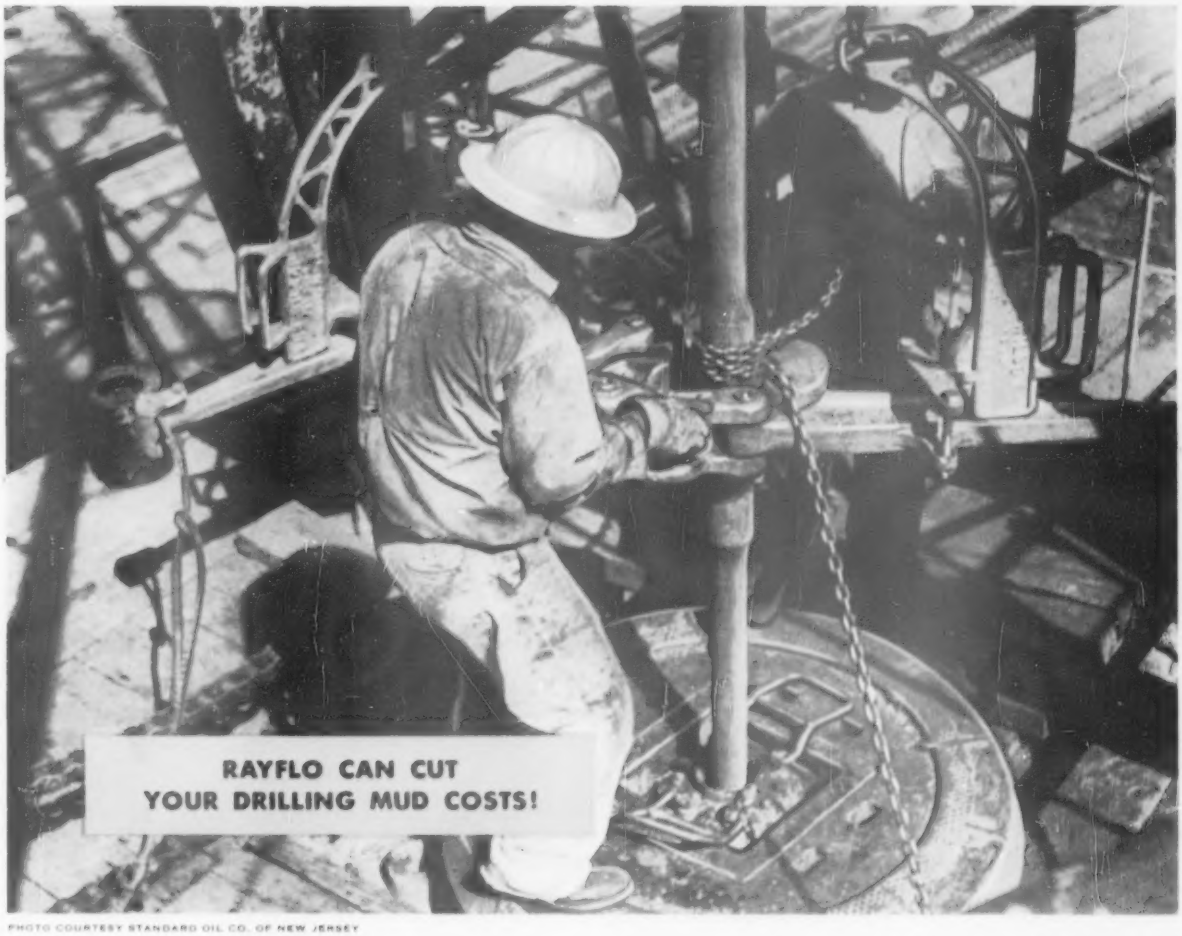

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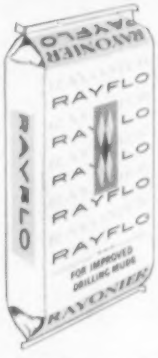

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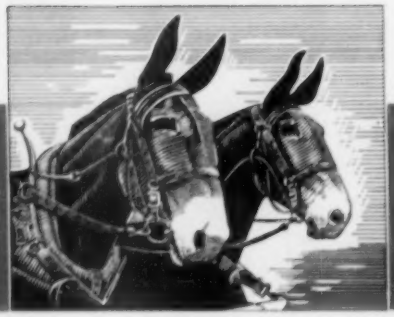

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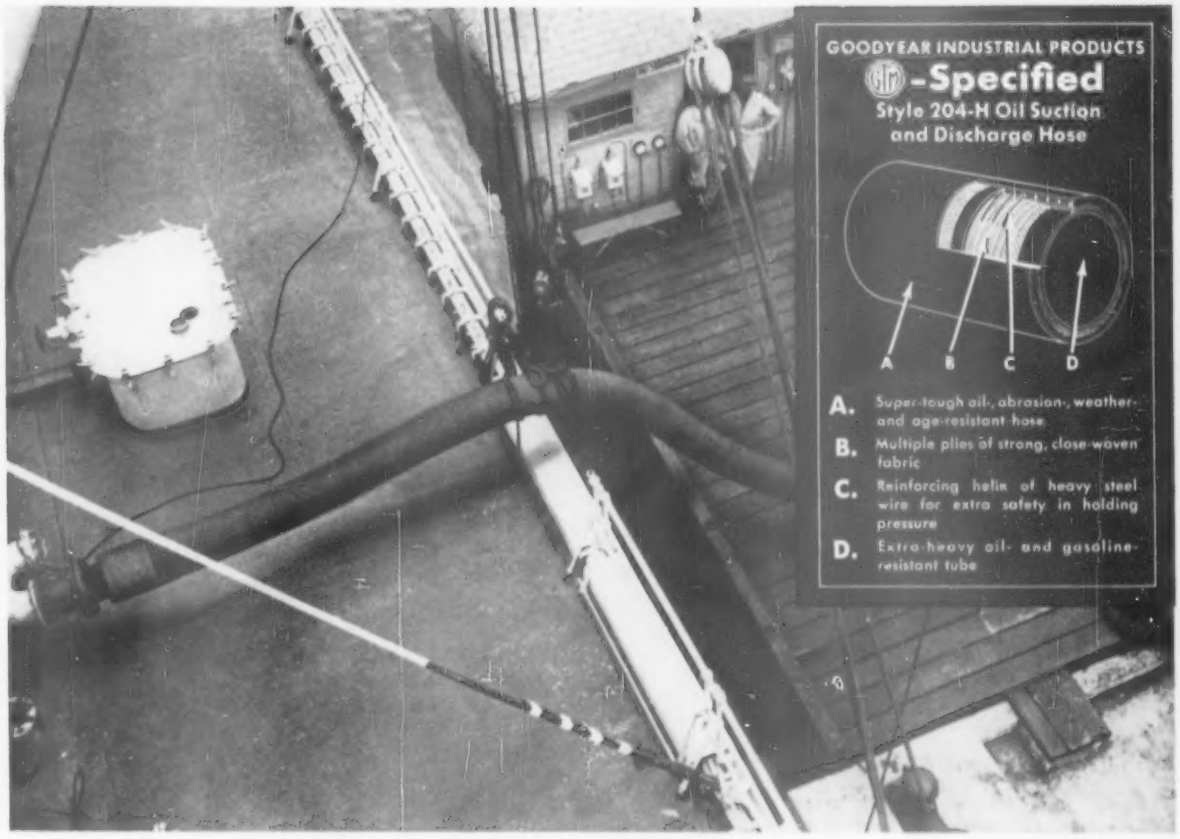
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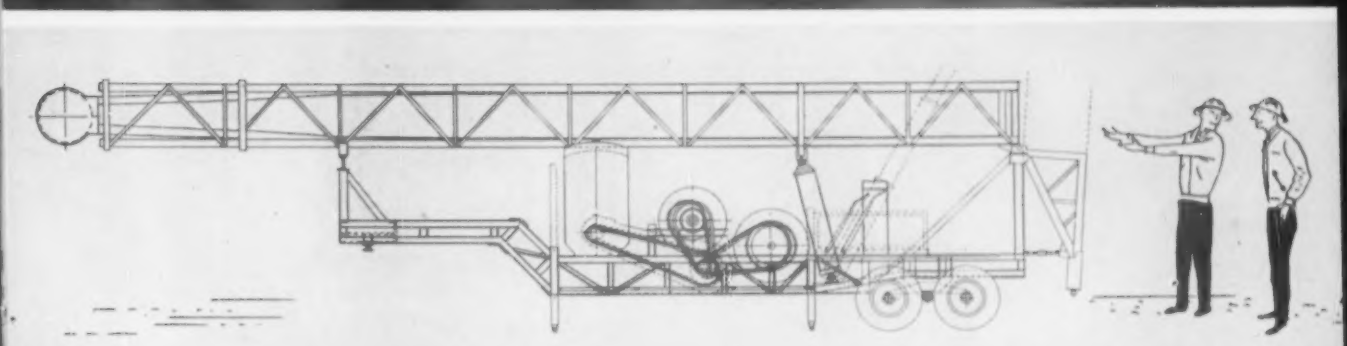

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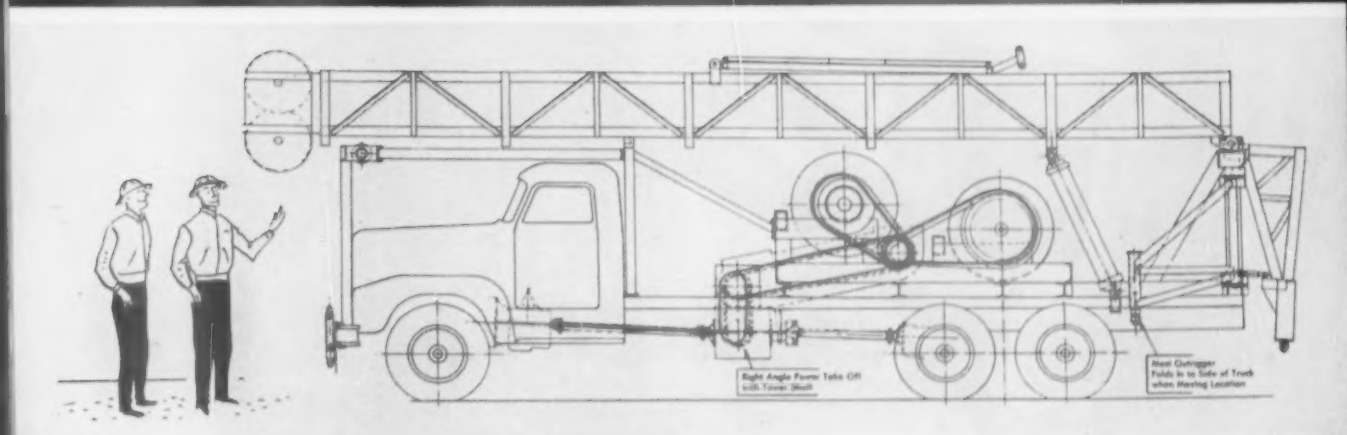

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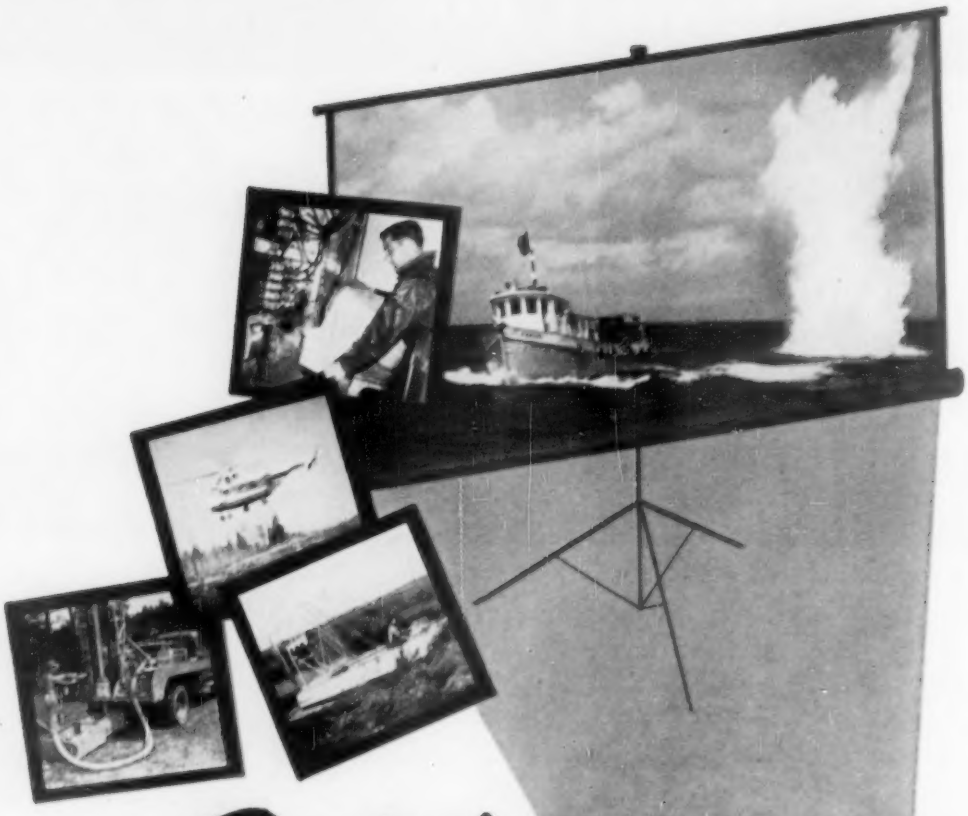
WILSON MANUFACTURING CO., Inc.

The HOME of RED IRON • WICHITA FALLS, TEXAS



Confidence

Here are some pictures of a General crew on one of our recent programs. This job was over land and water, too. You just can't beat General's background in all phases of geophysical exploration. In addition to unsurpassed accuracy and dependability, those people at General actually become a part of our organization when they work for us. I'm in favor of using them again for our next exploration project. We know they will do the job for us—right.

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Baroid Well Logging

lets you ride your bit to bottom:

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With Baroid Well Logging you *know* what's at the bottom of the hole. You know whether oil or gas exists, you obtain microscopic studies of cuttings for lithology and porosity, you know the thickness of formations, the drilling rate, and the condition and characteristics of the drilling fluid. These factors, correlated, give you a dependable log of your well — checked while the drill is making hole — and tell you when further testing is indicated.

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Used by Baroid engineers for their Well Logging mud-and-cuttings analysis . . . now available to you for use by your geologist and engineers. Use it at the well to determine coring depths, to interpret electrical logs, to pinpoint zones to perforate or DST, and to warn against possible blowouts.

Can be installed at well site or in geologist's field trailer or sample house. Only 4' x 2' x 1½'; weighs 350 lbs., uses only 300 watts of 115 volt power, AC or DC.

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Please send me your latest literature about Baroid Well Logging Service and your Automatic Gas Detector.

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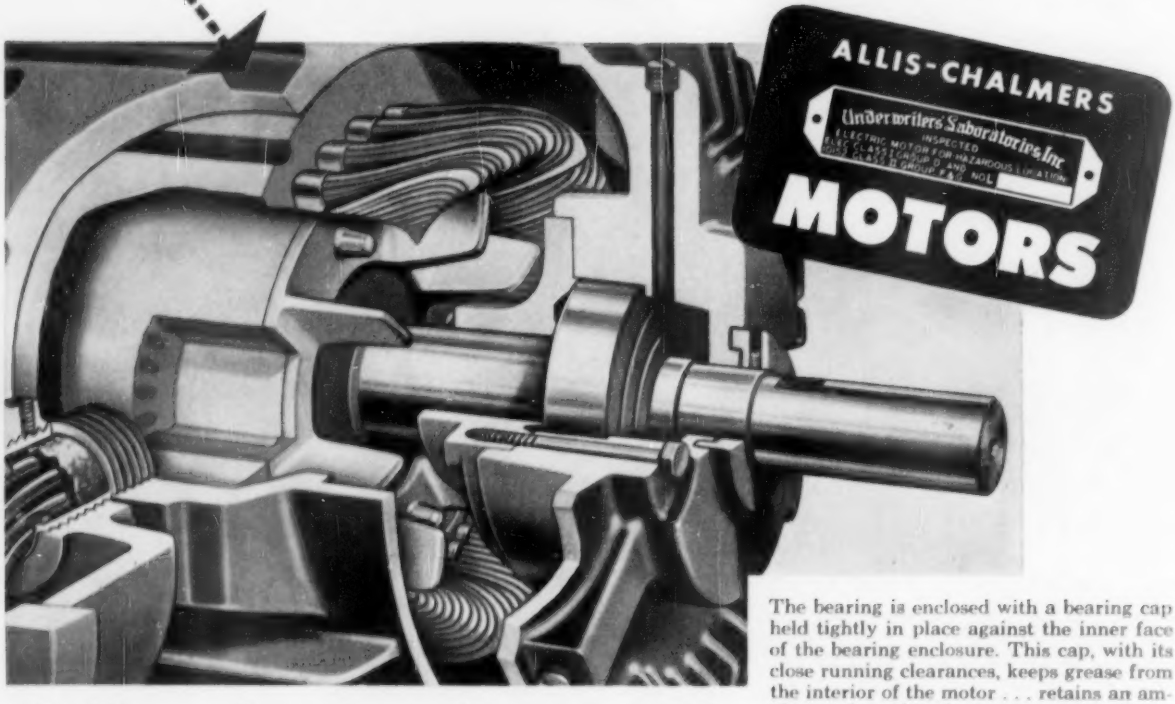
Get Both
bearing features

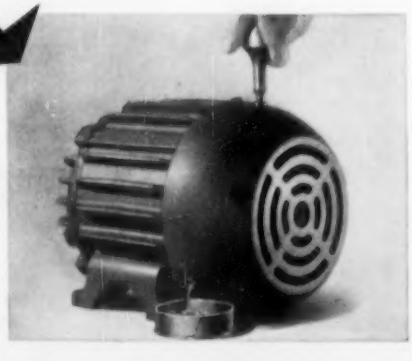


The bearing is enclosed with a bearing cap held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

fully enclosed and protected
. . . yet
easy to grease

You can lubricate the bearings without dismantling the motor. Pipe-tapped holes in the bearing housings at three points provide both means for inserting new grease and a means of flushing out old grease.



Look for the extra bolts on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7286.

A-4610

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For medium to heavy pumping loads in non-corrosive fluids Jones Carbon Type 2 rod offers quality and service unexcelled in its field. A very high grade carbon manganese steel is made to Jones specification, fully normalized and shot peened to add strength and endurance. Precision machining and processing are a required Jones standard. Include Jones Type 2 rods on your next order.

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SUCKER RODS
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These Balanced Physical Properties Are Obtained Through Carefully Controlled Chemistry

Yield (p.s.i.)	65,000
Ultimate (p.s.i.)	100,000
% Elong 8"	20.0
% Red. of area	60.0
Brinell Hardness	200
Charpy Impact	40
Izod Impact	80

PESA
PARTNERS IN PETROLEUM PROGRESS

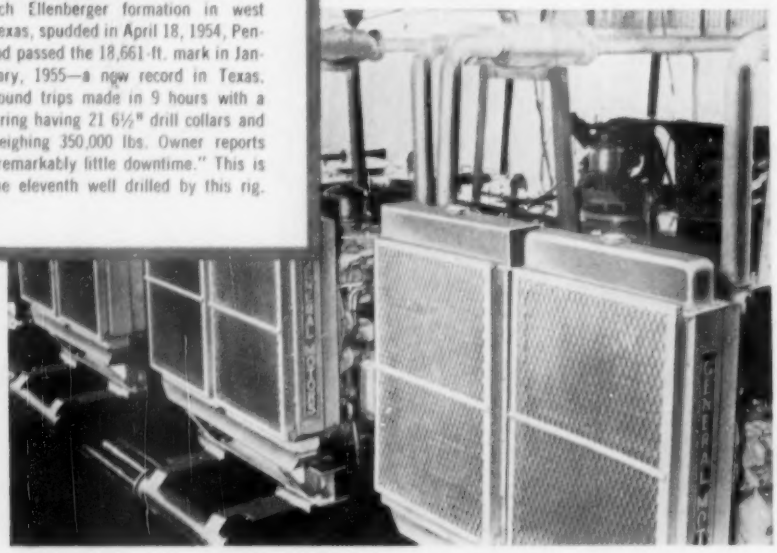
GM DIESEL
CASE HISTORY No. ID2-11

OWNER: Penrod Drilling Company, Shreveport, La.

INSTALLATION: 4 GM Twin "6-71" engines powering Brewster N-12 1500-horsepower "golden rig," with Lee C. Moore jackknife mast and two Wilson-Snyder 20" mud pumps.

PERFORMANCE: In deep-well test of rich Ellenberger formation in west Texas, spudded in April 18, 1954, Penrod passed the 18,661-ft. mark in January, 1955—a new record in Texas. Round trips made in 9 hours with a string having 21 6½" drill collars and weighing 350,000 lbs. Owner reports "remarkably little downtime." This is the eleventh well drilled by this rig.

Texas Depth Record Broken by GM Diesel-Powered Rig



DEWEY DAVIS, drilling superintendent for Penrod, will tell you it takes the *right* equipment, *good* crew work and *dependable* power to achieve a deep-well record like this.

And for big rigs that combine operating economy with portability, General Motors Diesel power is your best choice. Here are five reasons why:

1 **Low first cost**—as a result of General Motors' famous mass-production methods.

2 **Low fuel consumption**—unit injectors and blower scavenging mean more power from each gallon of fuel.

3 **Faster trips**—two-cycle design with power on every piston downstroke makes GM Diesel engines faster-accelerating.

4 **Quicker moves**—GM Diesels are more compact and weigh less than 4-cycle Diesels of comparable power rating.

5 **Service and parts availability**—no matter what out-of-the-way location you drill in, GM Diesel parts and service are never far away.

Want to make hole at less cost? Ask your General Motors Diesel distributor for a free power survey, or write direct to us.

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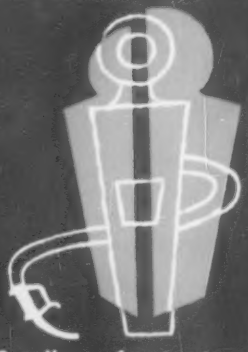
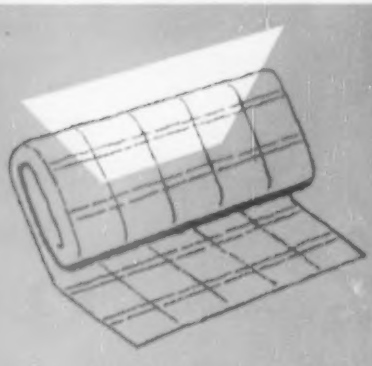
5 gallons of water to produce
1 gallon of milk

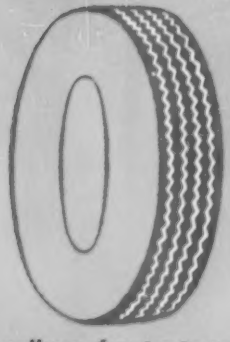


10 gallons of water to produce
1 gallon of gasoline

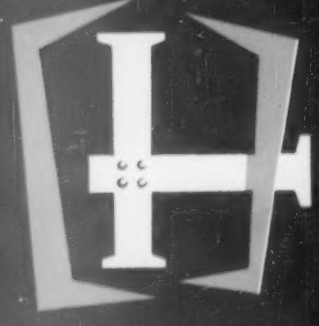


75 gallons of water to produce
1 pound of fabric

80 gallons of water to produce
1 KW hour electricity



300 gallons of water to produce
1 pound of synthetic rubber



65,000 gallons of water to
produce 1 ton of steel

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- 144—MAXIMUM STROKE (144 INCHES)
- 35—PEAK POLISHED ROD CAPACITY (35,000 LB.)

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A-912D-120-35
A-912D-120-30
A-640DB-144-35
A-640DB-120-35
A-640DB-120-35
A-456DB-120-30
A-456DB-100-30
A-320D-100-27
A-320D-86-27
A-228D-86-23
A-228D-74-23
A-160D-74-20
A-160D-64-20
A-114DA-64-16
A-114DA-54-16
A-80DB-54-16

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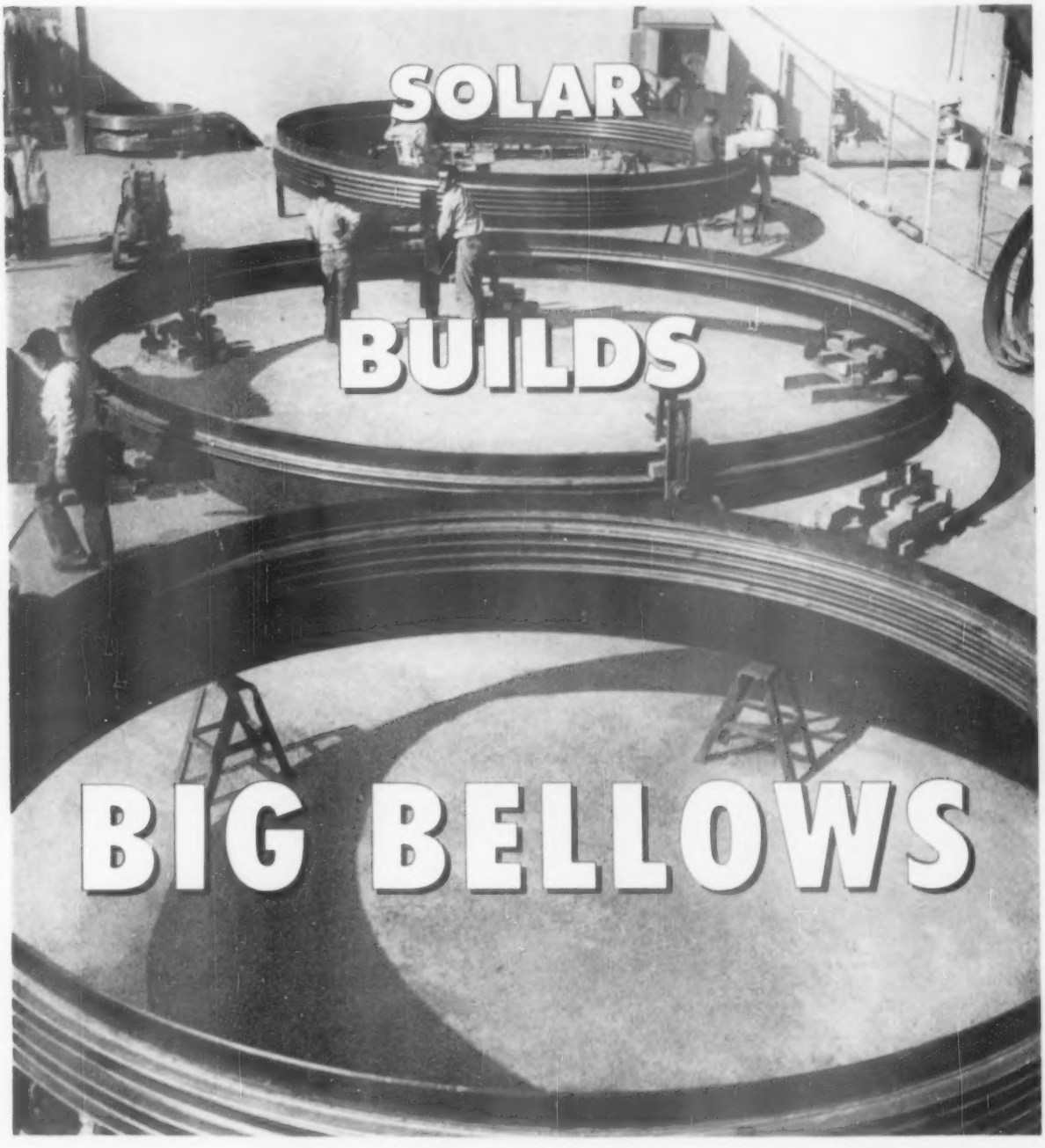

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These giant bellows are only one example of Solar's versatile production of expansion joints. There are also small bellows units in standard pipe sizes down to ½ inch for many applications. Further, Solar builds all major types of bellows—including convoluted for low pressure use and rugged U-span for heavy industrial needs.

In the petroleum, power, and many other industries, Solar bellows and expansion joints have been proven durable and economical. Both standard units and special designs are described in Sola-Flex catalogs. Experienced Solar engineering teams are available to help with unusual applications. Whether they call for giant expansion joints or tiny bellows—bring your problems of pressure and temperature to Solar. You'll get the right answer! Address Solar Aircraft Company, Dept. B-17, San Diego 12, California.

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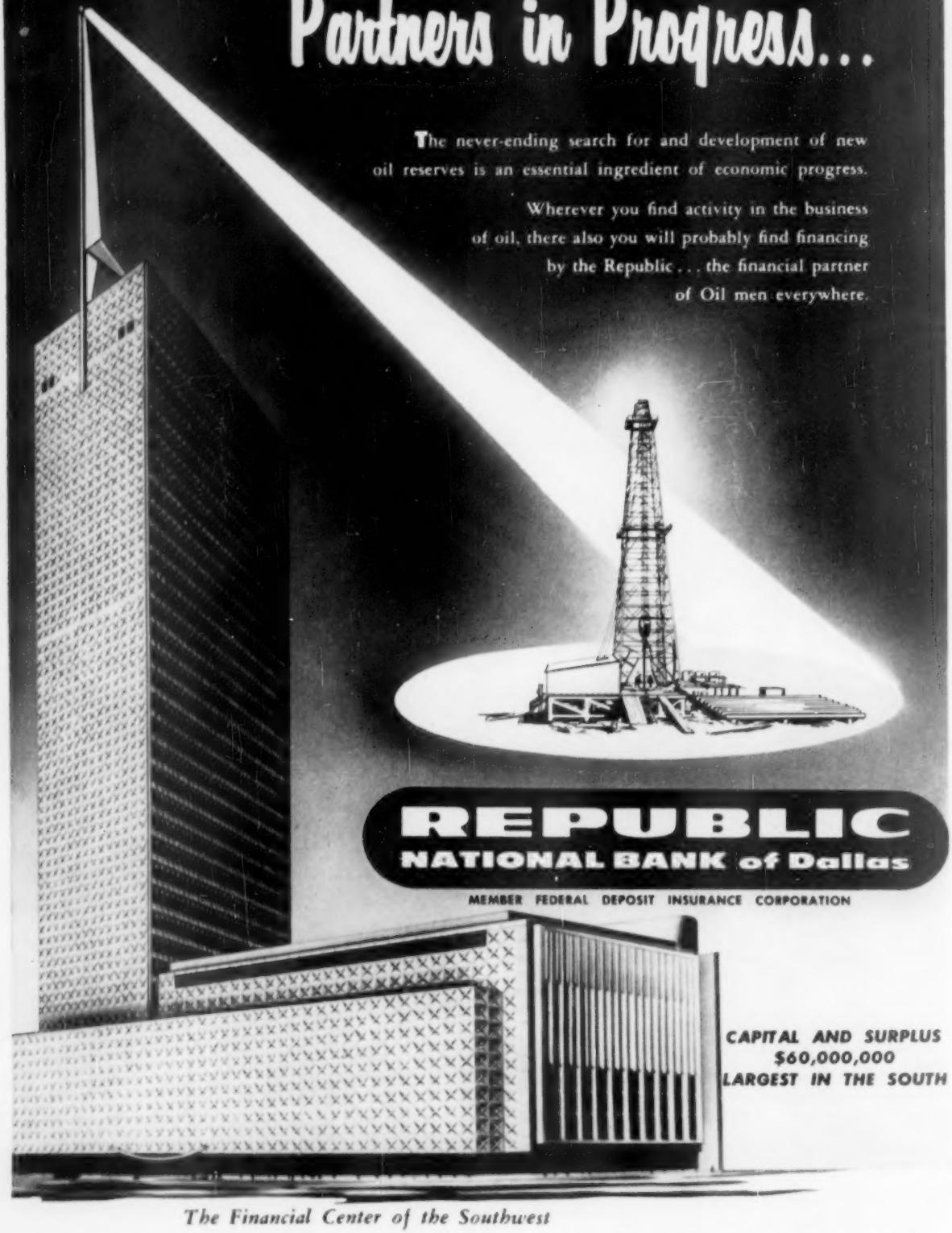

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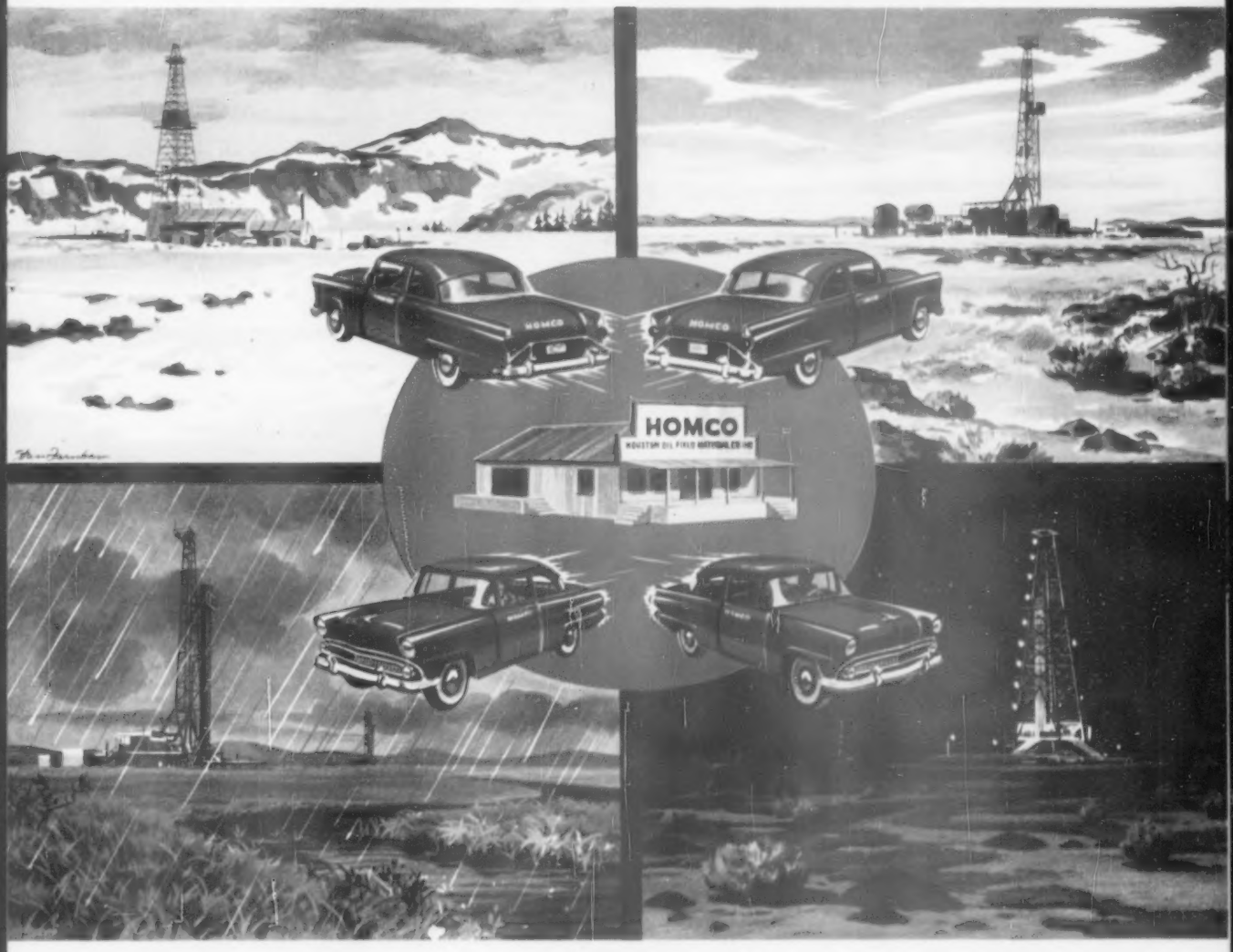

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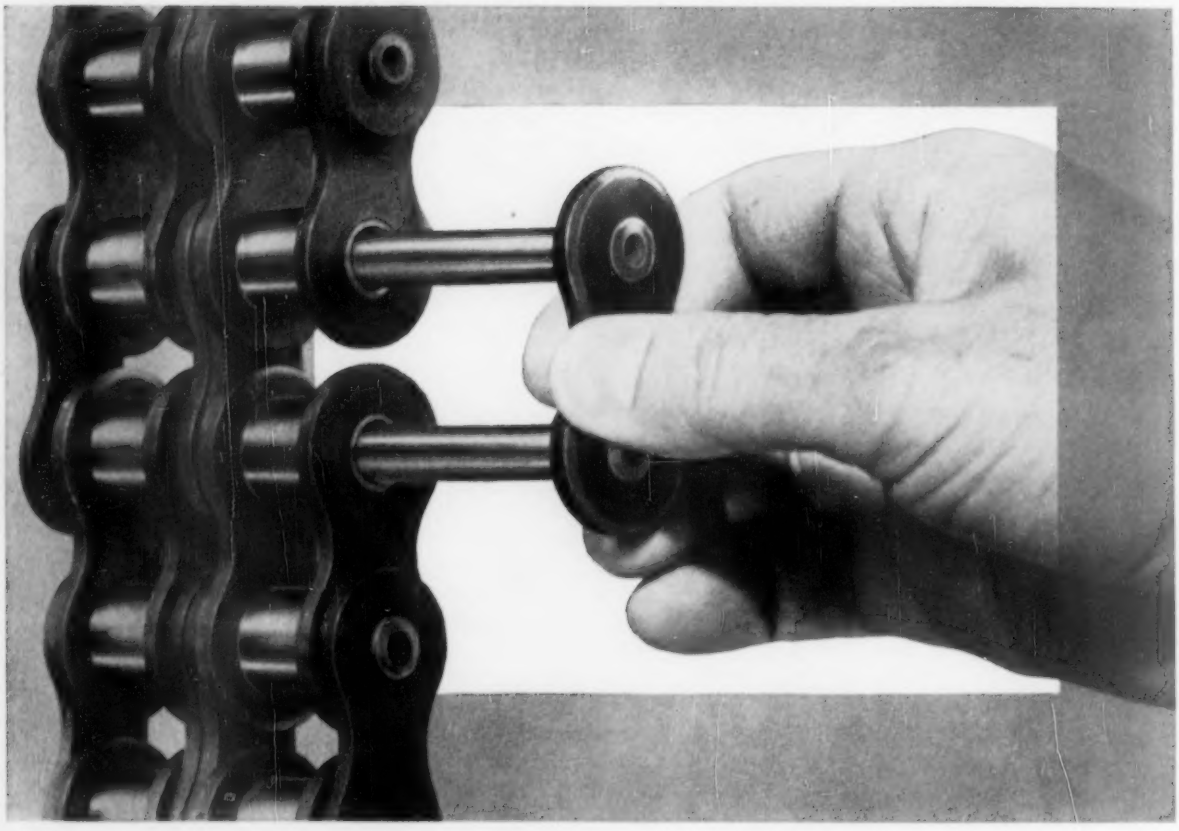

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Rex Oil Field Roller Chain is exactly what you've asked for...easy to take apart... easy to assemble...longer service life.

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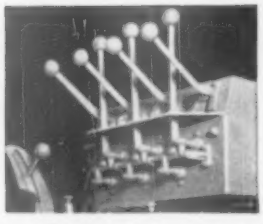
More "Big Machine" Features on the MICHIGAN C-16 than on any other ½-yard crawler!

This is a fact: more "big machine" features are *standard equipment* on the MICHIGAN C-16 than on any other ½-yard crawler. It will pay you to look underneath — look inside to see how much more you get for your money.

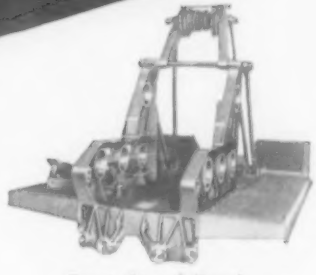
This machine is built for quality-conscious users—for bigger yardage, bigger tonnage, and substantially lower maintenance. The C-16 invites a feature-by-feature comparison with other same-capacity machines.

Write for detailed literature on this ½-yard crawler with big machine features and durability. Or contact your local MICHIGAN distributor. Like all MICHIGAN machines, the C-16 is available on a low-cost Lease Plan—details available.



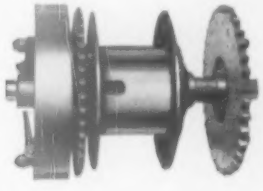
Power Control Independent Travel

Air Controls are standard on all MICHIGANs . . . fast, smooth, precise, with low operator fatigue. Independent Travel is also standard . . . move up while hoisting, swinging, or dumping.



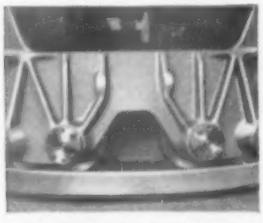
Cast Steel Deck

This feature is usually found only on 1-yd or larger machines. C-16 deck is one-piece, alloy steel casting . . . side frames, boom foot lugs and roller brackets are cast integral. No misalignment!



Power Load-Lowering

Four shafts on the C-16: Swing, Hoist, Travel and Crowd . . . each with its independent clutches. For precision crane work, the hoist line can be reeved on the front drum to provide Power-Up and Power-Down.



Six Hook Rollers

You can swing the boom just by leaning against it. There are 6 ball bearing-mounted adjustable hook rollers on the C-16 . . . grease twice a year. Most other ½-yd machines have only 3 or 4 rollers, bushing-mounted.

Smooth Clutches

There's nothing smoother than MICHIGAN air-operated segmented disc clutches . . . and they are self-compensating for heat, self-ventilating and self-cleaning. All segments are interchangeable.

Cast Steel Car-Body

Circle gear, with hook roller paths, internal gear teeth, center post, and crawler drive gear case is cast integral. Standard alloy steel tracks are 20" wide, 9'10" long. Swamp pads are optional: 30" wide, 11'10" long.

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Construction Machinery Division
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☐ C-16 Detailed Bulletin

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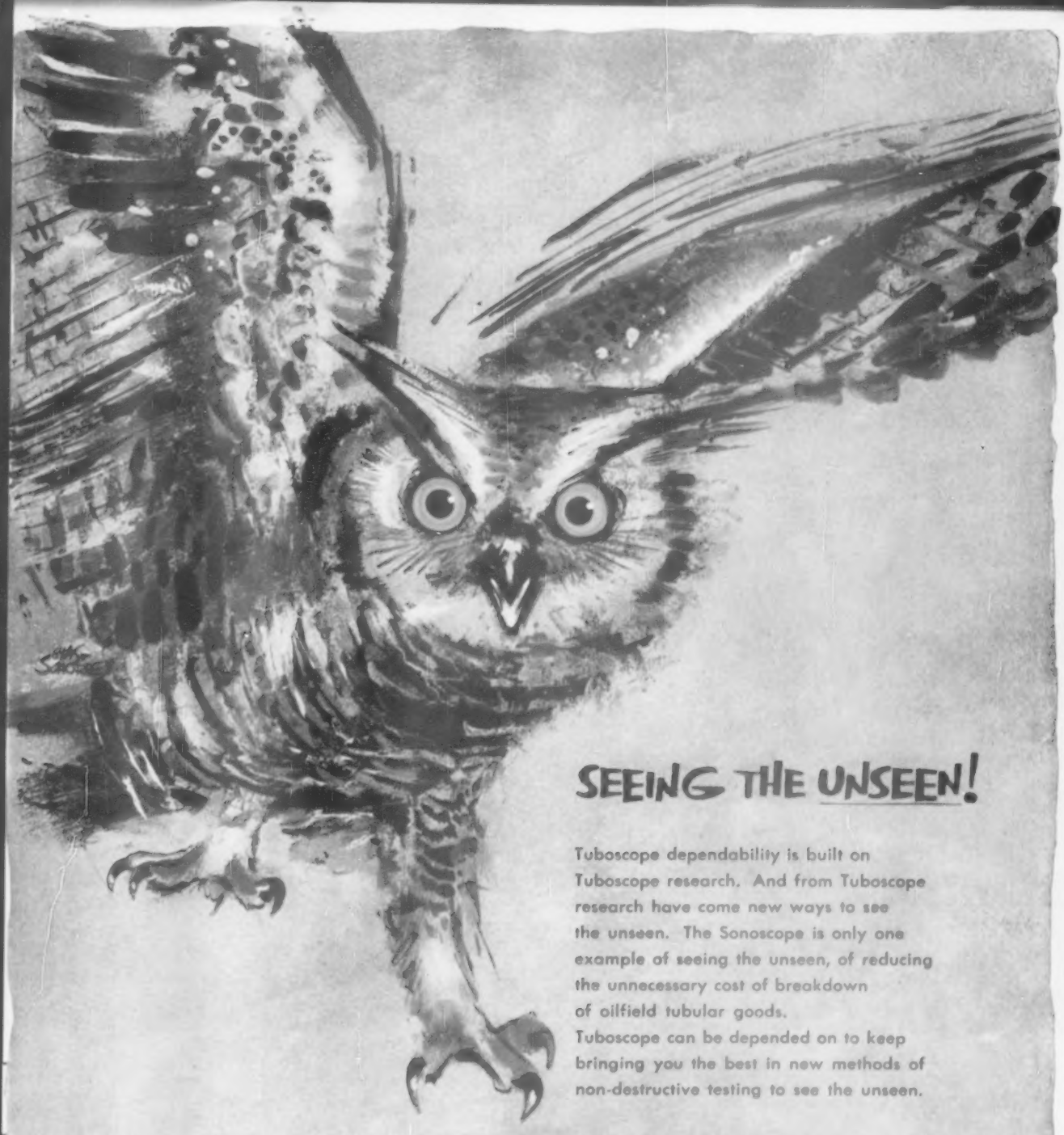

SEEING THE UNSEEN!

Tuboscope dependability is built on Tuboscope research. And from Tuboscope research have come new ways to see the unseen. The Sonoscope is only one example of seeing the unseen, of reducing the unnecessary cost of breakdown of oilfield tubular goods.
Tuboscope can be depended on to keep bringing you the best in new methods of non-destructive testing to see the unseen.

Tuboscope COMPANY

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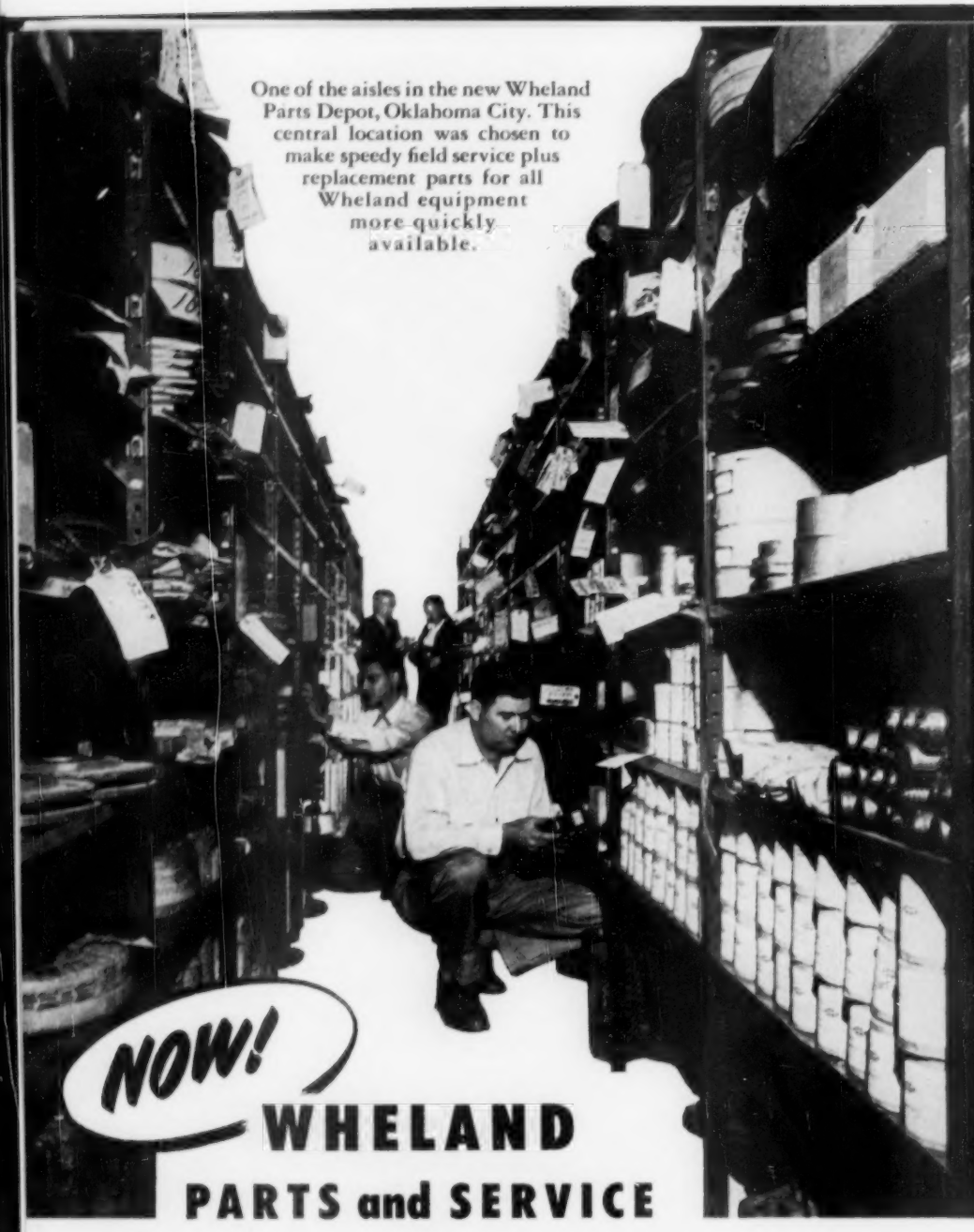

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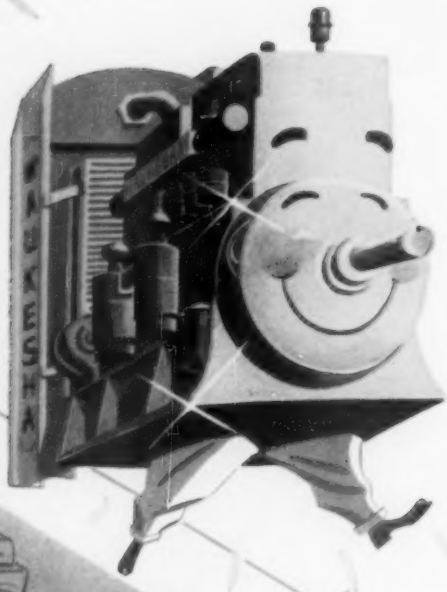
Rust-Oleum Corporation
2544 Oakton Street, Evanston, Illinois
Gentlemen: I am interested in the complete Rust-Oleum story. Please send me the facts and the name of my nearest Rust-Oleum Industrial Distributor.

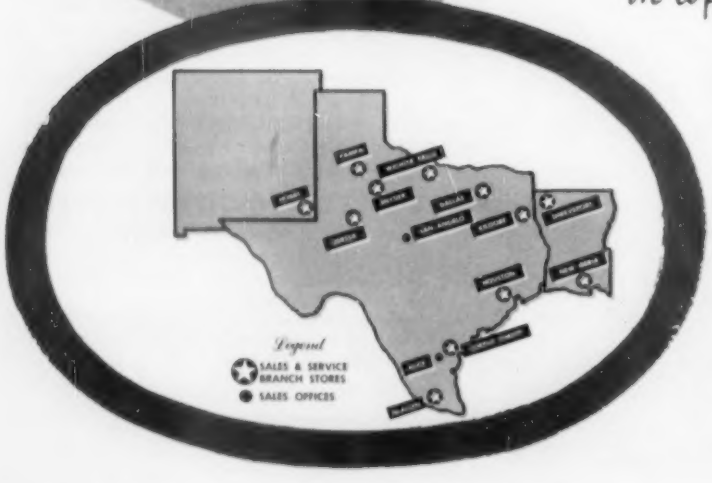
Name_____
Address_____
City_____ State_____

this engine went HOME for repairs



to Waukesha Sales & Service, Inc.

Here's an engine that is ready to go-and go-and go. It's been home for repairs to Waukesha Sales & Service, Inc. Buy it from Waukesha Sales & Service, Inc. and let them give it the expert, personalized attention it needs to keep it in top shape all the time.



YOUR WAUKESHA ENGINE
IS TREATED BEST AT HOME

WAUKESHA

Sales & Service, Inc.

1422 MAURY ST. • HOUSTON, TEXAS

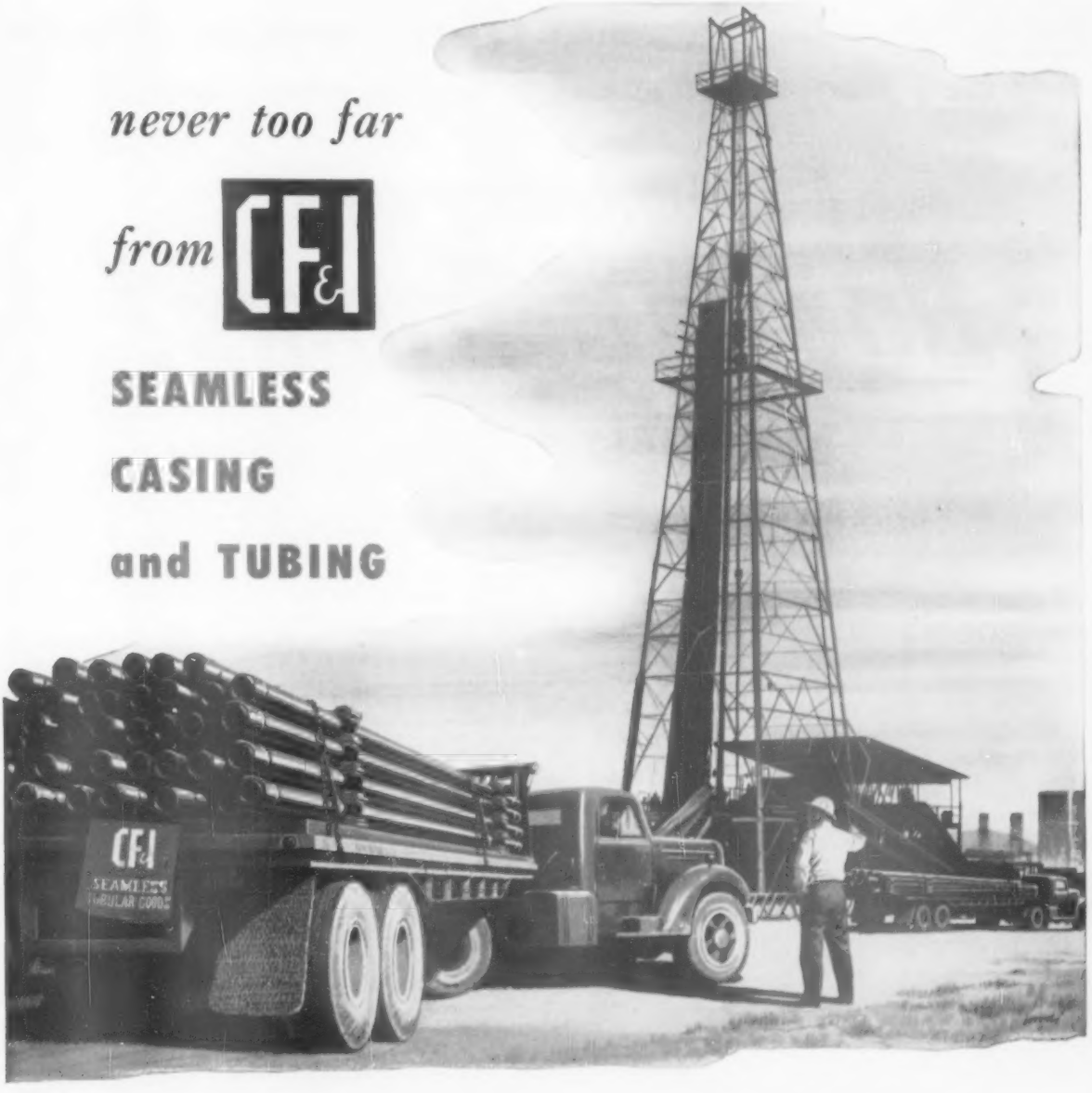
EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, NORTH AND WESTERN LOUISIANA, SOUTHERN ARKANSAS AND NEW MEXICO

WORLD'S LARGEST DISTRIBUTOR OF OIL FIELD ENGINES

never too far

from CF&I

SEAMLESS CASING and TUBING



NO MATTER where the rig may be located in Western oil country, it's always within prompt and economical reach . . . by rail or truck . . . of the CF&I Seamless Tube mill at Pueblo, Colorado.

Need for this "localized" source of supply for casing and tubing was the motivating force that brought into existence this great new mill—incorporating fabricating facilities that are up-to-the-minute; testing and inspection techniques that are unrivalled in the industry.

We'd like to have you see for yourself. Next time you're out this way, we'll be happy to take you through the plant and show you why we're so proud of our modern seamless tube mill.

CF&I Seamless Oil Country Casing and Tubing are available in sizes from 2⅜" O.D. through 9⅝" O.D.—meet API STD 5A specification.

CF&I TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION
DENVER, COLORADO

CF&I

2672

Now - out of Chrysler Corporation... come the most rugged trucks ever built!

Announcing new Dodge "Job-Rated" Trucks!

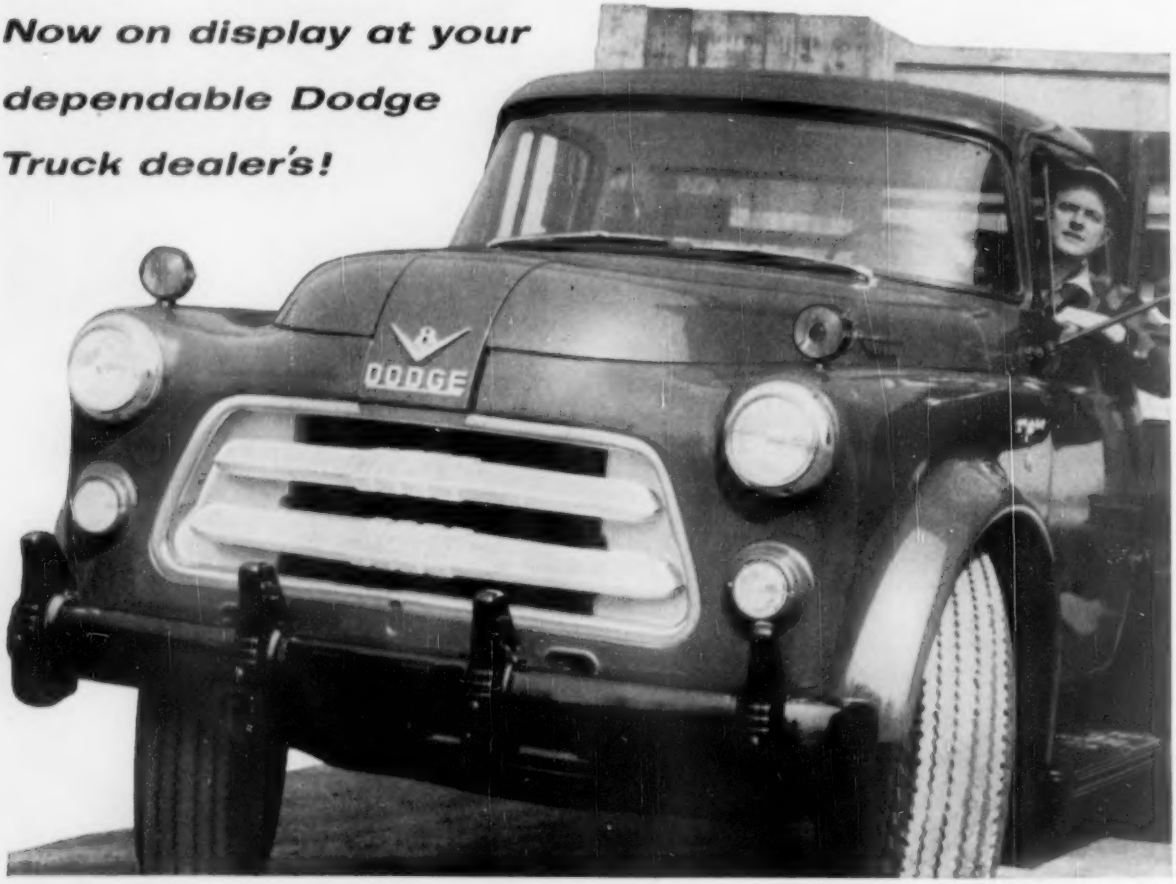
The **power line** with **full view** design!

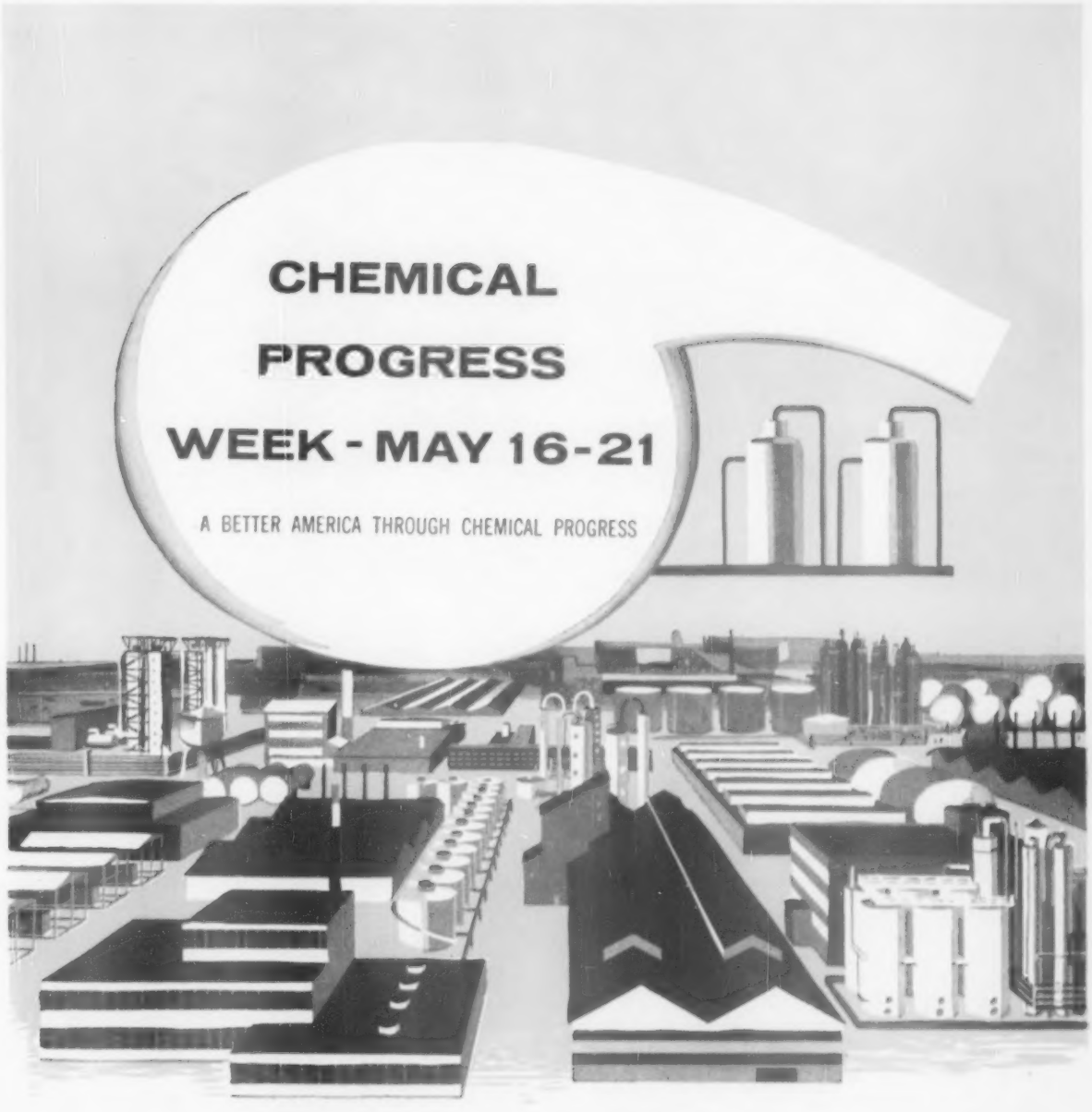
NEW! Super Power-Dome V-8 engines—169 to 202 hp.—the world's most powerful low-tonnage V-8's—and the most dependable sixes!

NEW! Full-view design with biggest wrap-around windshield of any make! Wrap-around rear window available, too! You get greater safety, easier handling!

NEW! Higher payloads, new no-clutch transmissions, power steering and braking, fuel-saving overdrive! Plus smartly-styled interiors, colors, 2-toning! Over 100 new features!

Now on display at your dependable Dodge Truck dealer's!





all industry has helped to make chemical progress

When we think of the astounding progress of the chemical industry, we think also of the progress of every other industry. For only the chemical industry markets its products to all 72 major U.S. industrial groups—and the progress of our industry is linked inseparably with the progress of all other industry.

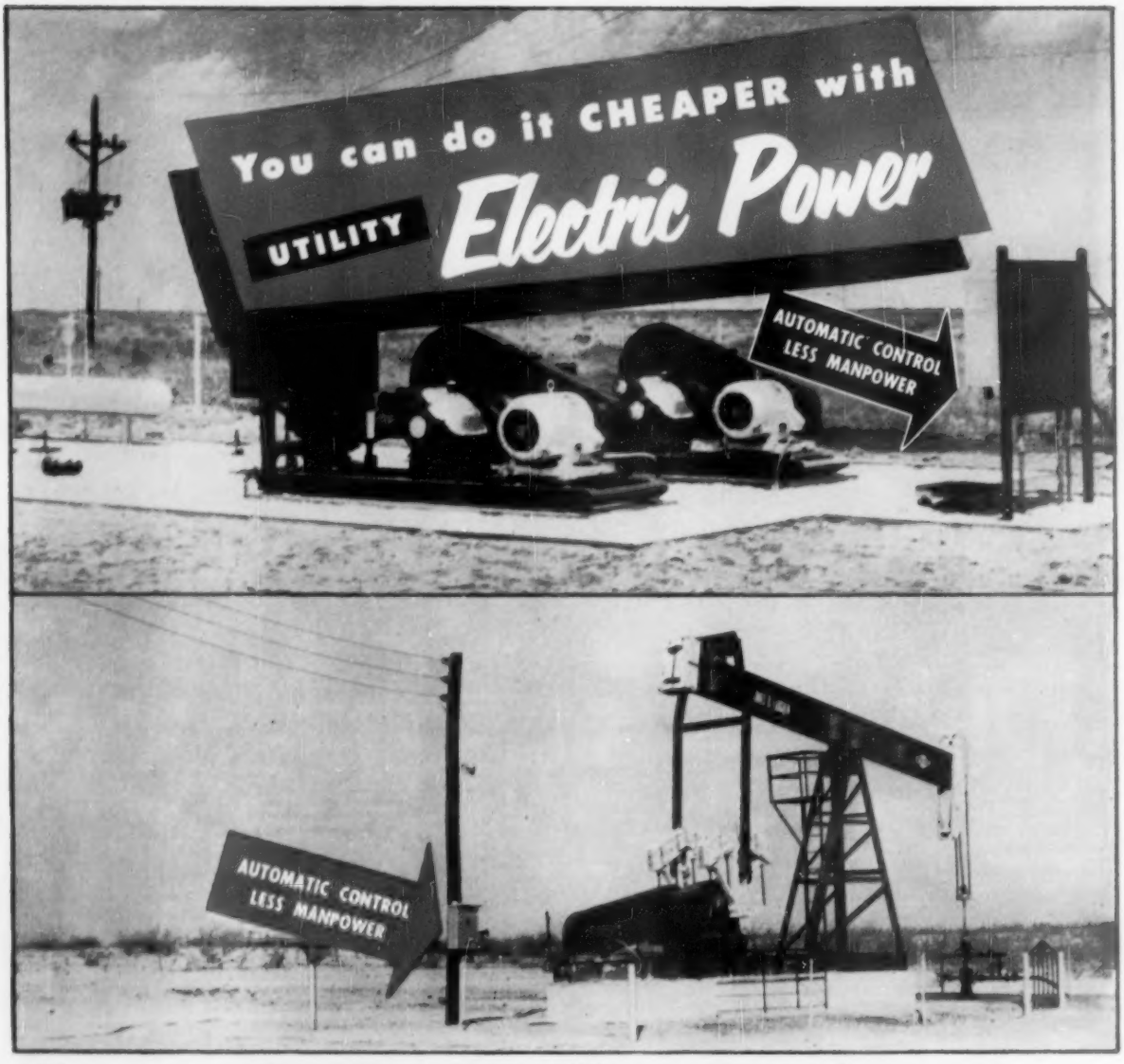
Obviously, every chemical innovation, to be successful, must find a market. Chemical sales, which have climbed from $4 billion in 1939 to over $20 billion annually today, mean simply that the users of chemicals have been receptive and alert, and have found the way to turn new chemical products and processes to their own advantage.

Columbia-Southern is proud to be a member of the chemical industry and, in marking the second annual Chemical Progress Week, salutes *all* industries for their part in making this progress possible.

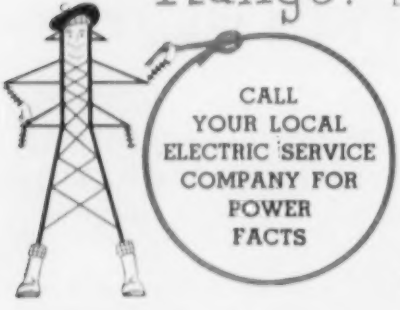
COLUMBIA-SOUTHERN
CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte
Chicago • Cleveland • Boston • New York
St. Louis • Minneapolis • New Orleans
Dallas • Houston • Pittsburgh
Philadelphia • San Francisco

IN CANADA: Standard Chemical Limited
and its Commercial Chemicals Division



Electric Power is at Home on the Range!



Location and terrain are no handicaps — your Utility Electric Power Company is well equipped to give you the best power service — anywhere — any time. Pipeline pumping or production pumping, whatever the job, you can depend on Low Cost Utility Electric Power to do that job at lower installation, operating, maintenance and labor costs. There's no waste with Electric Power . . . just the right amount for the right job.

Petroleum Electric Power Association

P. O. BOX 2771, DALLAS, TEXAS

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

35 EXCHANGERS
6 DIFFERENT SERVICES
55,475 FT. OF SURFACE

All interchangeable with 1 bundle!

This made sense to... so why not use it in an ad?

Phillips 66

NOTE: With increased interest in STANDARDIZATION this job should command attention!!

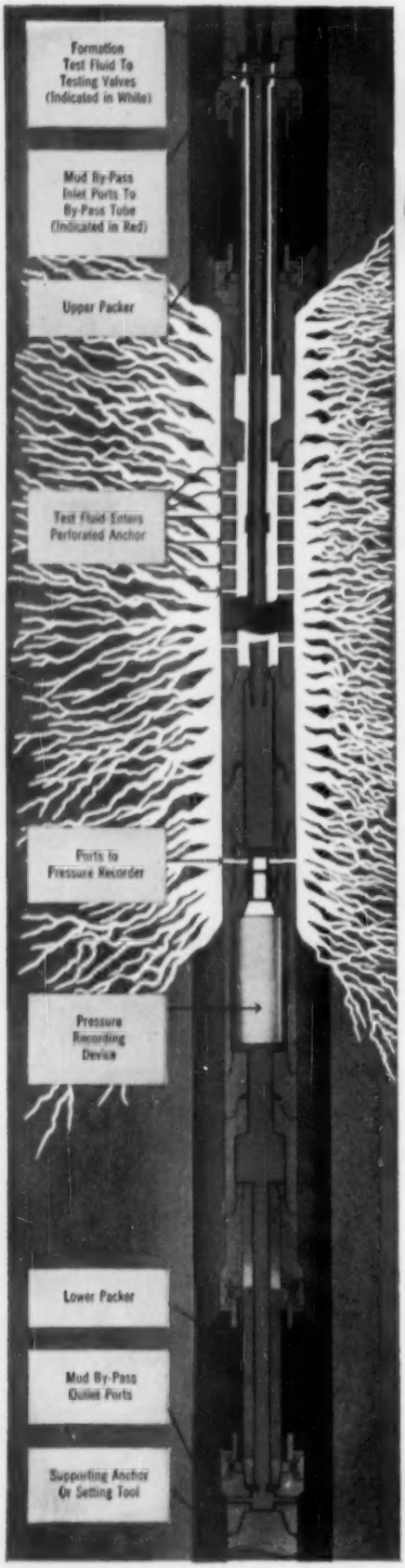
Here are the photos of the 35 exchangers

WESTERN HEAT EXCHANGERS

WESTERN SUPPLY COMPANY
P. O. BOX 1888 • TULSA, OKLAHOMA

HUDSON-RUSH COMPANY—753 Gladstone Blvd., Shreveport, La.
130 Casa Linda Plaza, Dallas 18, Texas
PROCESS INSTRUMENTS & EQUIP. CO.—North Bldg., Charleston, W. Va.
H. W. SEVERANCE—Marion E. Taylor Bldg., Louisville, Ky.

Use same sig


Formation Test Fluid To Testing Valves (Indicated in White)
Mud By-Pass Inlet Ports To By-Pass Tube (Indicated in Red)
Upper Packer
Test Fluid Enters Perforated Anchor
Ports to Pressure Recorder
Pressure Recording Device
Lower Packer
Mud By-Pass Outlet Ports
Supporting Anchor Or Setting Tool

Straddle Testing

in open hole
another Johnston first*

Now, with complete confidence, you can...

- EVALUATE UP-THE-HOLE ZONES
- LOCATE GAS, OIL, AND WATER CONTACT
- HELP PROTECT HOLE AND SUPPORTING ANCHOR

See how Johnston Straddle Testing with STRADDLE MUD BY-PASS maintains full hydrostatic mud pressure on upper and lower packers—and on all formations below lower packer. Lessens the load on supporting anchor and prevents production from any lower zone in the event of lower packer failure. Should either packer fail, you get an immediate surface indication. Get all these advantages plus ease of running tool into and out of the hole.

*Johnston Straddle Testing with Straddle Mud By-Pass is covered by patent and patents pending. Another Johnston first!

for descriptive folder write to:

JOHNSTON TESTERS

first in drill stem testing

P. O. Box 98,
HOUSTON, TEXAS

LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

ST 663

R. Lacy, Inc., Frost Hull Station, Carthage, Texas — equipped with one 440 h.p. 8SVG and one 550 h.p. 10SVG Beaird-Ingersoll-Rand four cycle gas engine driven compressor plants with Young radiators and all necessary controls. Other sizes 110 to 660 h.p.

R. LACY, INC., has planned its Frost Hull station to utilize to the fullest the flexibility of operation possible with packaged compressors. Boosting gas from nearby Carthage, Texas, fields into a sales line, the station was initially equipped with a single 8SVG 440 h.p. Beaird-Ingersoll-Rand packaged compressor plant. The original piping of the installation included connections for the addition of a second packaged unit should wellhead pressures continue to drop off. A year later a 10SVG 550 h.p. Beaird-Ingersoll-Rand packaged compressor was added.

Now operating with single-stage compression, the units pick up gas at 475 psig and boost it to 1,175 psig for delivery to the line. Should wellhead pressures continue to decline, a third unit could be added to the station or the existing units changed over to two stages of compression. Later one of the units could be transferred to other service leaving the remaining plant to complete production. Requiring a minimum in the way of foundation and connecting piping, the entire compressor installation will be almost wholly salvageable when moved.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor plant can be designed to meet your requirements.

Handle Pressure Drop Off —

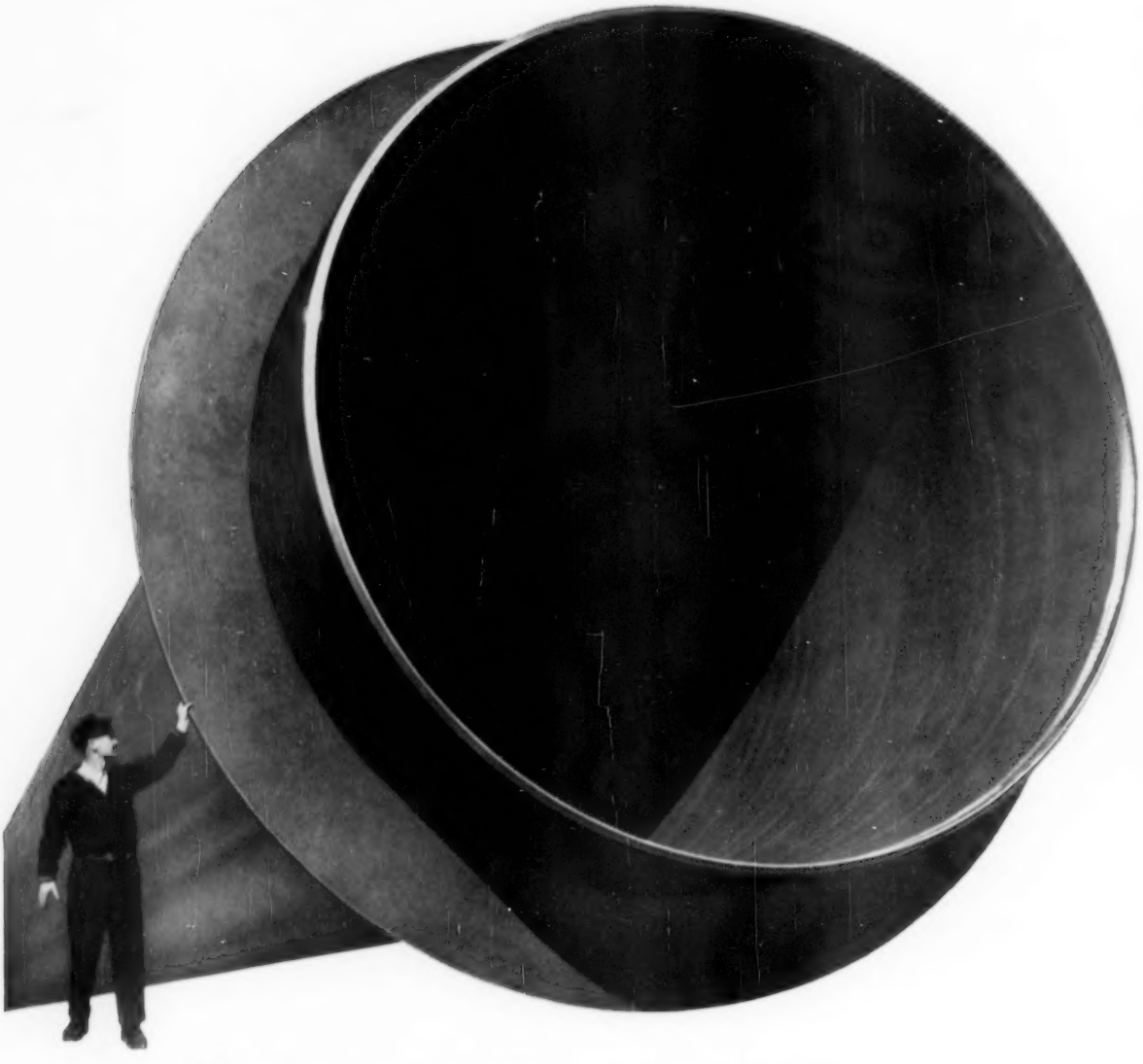
FLEXIBLE INSTALLATION MADE WITH PACKAGED COMPRESSORS

THE J. B. BEAIRD COMPANY, INC.

Shreveport, Louisiana

BEAIRD

MACHINING • MANUFACTURING • STEEL WAREHOUSE



How to make pipe ring true

THE RING TEST given to Basalt-Kaiser steel line pipe is your assurance that it fully complies with requirements for size and roundness.

This is one of a series of tests which begin during raw materials mining and continue through the manufacture of finished pipe by precision equipment.

As a result, Basalt-Kaiser steel line pipe meets *all* industry specifications for on-the-job workability and durability.

In addition, our customers are assured of on-time delivery. Our experienced technical and metallurgical staffs are always ready to give personal attention to your problems.

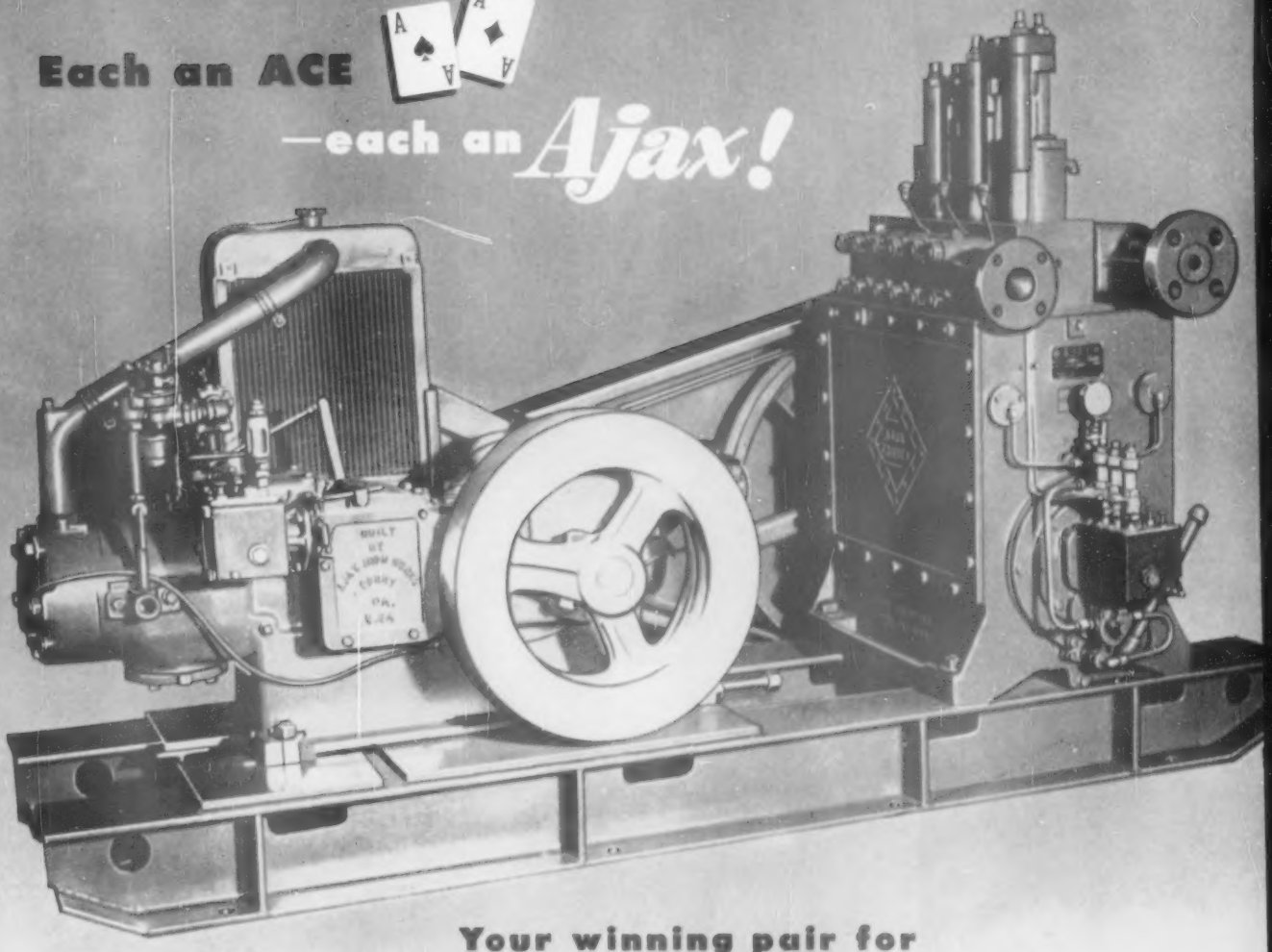
Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld – Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld – Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance Weld – Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif. – Basalt-Kaiser
Electric Resistance Weld – Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld – Expanded – Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif. – Basalt-Kaiser

Prompt, dependable delivery at competitive prices • **KAISER STEEL CORPORATION** Los Angeles, Oakland, Seattle, Portland, Phoenix, Denver, Tulsa, New York

Each an ACE —each an *Ajax!*



Your winning pair for
LOW COST FLUID INJECTION
and HYDRAULIC PUMPING

Ajax

GAS and OIL ENGINES
PRESSURE PUMPS

This AJAX prize package is easy to buy, easy to install, and runs by itself to save money for you the year around. It will pay you from the start to get the facts on Ajax Pump and Gas Engine economy . . . ask your Supply Man today about these dependable performers that *use petroleum products while they build petroleum profits!*

AJAX

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AJAX IRON WORKS

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS,
STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

CORRY, PENNSYLVANIA

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.
R. B. MOORE SUPPLY CO., BOLIVAR, N.Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA

Wild wells are the dilemma of all operators. These extremely costly accidents still happen, usually resulting in the total loss of a drilling rig, well bore, and valuable reservoir pressures. A typical case is presented above and at right which illustrates the accepted procedure for capping a wild well.

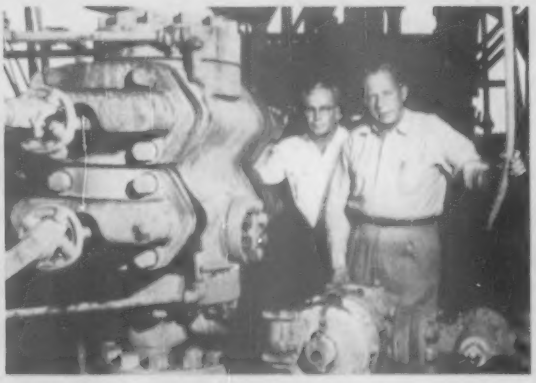
With most of the wreckage cleared away, a water-cooled container of explosive is spotted near the burning well.

IT DIDN'T HAPPEN HERE

"SS" SUCCESS STORY

The thousands of wells drilled each year that *don't blow out* seldom make the headlines. Two wells (right), drilled recently in the Gulf Coast area are typical. Both wells attempted to blow out but were quickly and easily shut in with the aid of Cameron's Type "SS" Pressure-Operated Blowout Preventers.

Cameron
IRON WORKS, INC.
P. O. Box 1212 - Houston, Texas
Export Office: 7912 Empire State Bldg., New York City



Cellar view on a Foster Drilling Company rig at Lake Arthur, Louisiana. Cameron's I. E. Moses and Foster's Toolpusher, Jack Beckham, pictured with the "SS" Preventer which closed against 5400 lbs. well pressure at the time well was attempting to blow out. "A mighty fine little preventer," Mr. Beckham stated.

S. N. "Scotty" Lamberth of Cameron, and Penrod Drilling Company's satisfied Toolpusher, Melvin Hennigan, with a Cameron "SS" Preventer in background. Under extreme pressure and difficult sanding conditions, the "SS" Preventer closed satisfactorily.

From a remote vantage point the explosion is set off, snuffing out the blaze.

With the fire out, the well continues to blow gas and oil until workmen install a Cameron Capping Manifold.

The Cameron "SS" Preventer at left was designed especially for drilling rigs having a low substructure. In addition to its numerous proven mechanical features which make all Cameron Drilling Control Units distinctive, its low over-all height and compactness make the "SS" particularly desirable where cellar space is limited.

MEN WHO KNOW — TAKE "BLUE DEMONS" WHEREVER THEY GO

SEISMIC contractors experienced in the use of Hawthorne Bits know that it's just as easy to get, and economical to use, "Blue Demon" Bits any time, anywhere, around the exploration world.

Their own impartial performance tests with "Blue Demon" Bits in shot hole drilling have proved that they can get more footage faster, at lower cost per profile, in 90% of all formations drilled.

They know, too, that "Blue Demon" Bits are just as easy to obtain for international exploration operations, and far more economical and efficient to service in foreign fields. "Blue Demon" Blades are replaced when worn, right on the drill . . . requiring no retipping, dressing or rebuilding in inconvenient, out-of-the-way places. This factory-controlled quality bit service, "on the drill," is worth far more in time and labor saved than the slight fraction-of-a-cent per foot it costs to import "Blue Demons," any size, any time, anywhere.

Ocean freight should average only $3 to $5 per 100 pounds, depending on the destination, with complete CIF charges not exceeding 10% of evaluation. Shipments are handled promptly and efficiently from Houston and New York.

Write our Houston office today for complete details on the necessary papers and import applications required. Your inquiries will be answered the day received.

U. S. PATENTS
2,615,684
2,666,622
OTHERS PENDING

* *If you need your "Blue Demons" in a hurry, air freight shipments can be processed the day your order is received, subject to customs requirements. "Blue Demons" are traveling daily, by land, sea and air, to destinations everywhere. Plan now to get the benefits of "Blue Demon" Bit Service on your next prospect.*

WRITE FOR ILLUSTRATED CATALOG

HERB J. HAWTHORNE INC.

P. O. BOX 7366, HOUSTON 8, TEXAS

Safety at the L.P.G. loading rack — thanks to Rockwood Ball Valves

This Eastern loading rack runs no risk of gas seepage when trailer tankers are being filled. Rockwood Ball Valves are the reason why.

The quick opening and closing of these valves is a tremendous asset during loading. But of primary importance is the fact that Rockwood Ball Valves are *leakproof*.

These four exclusive features guarantee the trouble-free performance and efficiency of Rockwood Ball Valves —

Full Round Flow — no change in shape or volume of fluid stream — no turbulence — no minimum loss.

Quick Opening and Closing — only a quarter turn needed.

Longer Wear-Resistance — chrome-plated bronze ball withstands abrasion, pitting and scratching.

Leakproof Seal — pressure of fluid automatically positions ball against seat to form tight seal.

If you are not now using Rockwood Ball Valves, send coupon today for complete information. Valves come in all pipe sizes. Tested and listed by Underwriters' Laboratories, Inc.

ROCKWOOD BALL VALVES

ROCKWOOD SPRINKLER COMPANY
525 Harlow Street
Worcester 5, Mass.

Send me illustrated folder V-4 on Rockwood Full-Flow Ball Valves.

Name_____

Title_____

Company_____

City_____

Zone_____ State_____

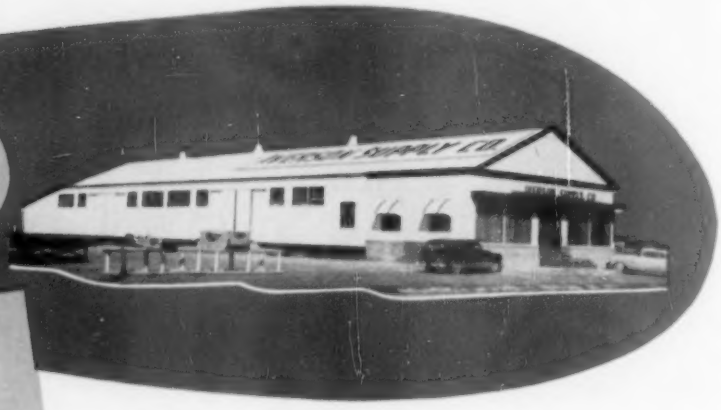
IVERSON

FAST SUPPLY STORE SERVICE

IVERSON SUPPLY COMPANY'S stores pride themselves on filling the needs of their customers completely and with greatest speed. Back of the products is the integrity of the manufacturer and a guarantee of satisfaction. With this is the long years of experience of IVERSON representatives under practically all oil industry conditions. Their advice, based on knowledge and sound judgment, is part of our company's service.

WHATEVER YOUR REQUIREMENTS CHECK WITH IVERSON FIRST

Stores at Artesia and Farmington, New Mexico; Ada, Oklahoma City, Okmulgee and Tulsa, Oklahoma; Kermit, Odessa, and Snyder, Texas; and Price, Utah.



IVERSON'S NEW STORE AT ODESSA, TEXAS

OFFICES: FT. WORTH, DALLAS & MIDLAND, TEXAS

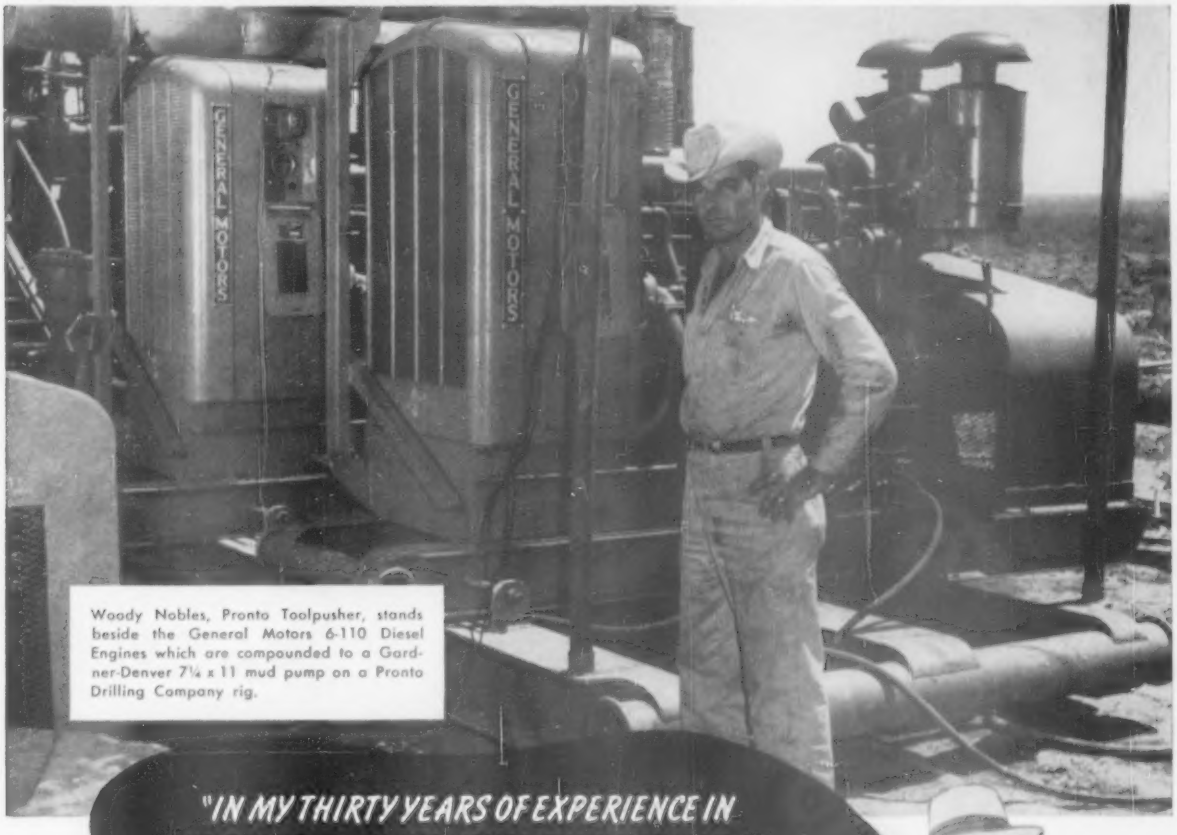
IVERSON SUPPLY COMPANY

DRILLING-PRODUCTION AND REFINERY EQUIPMENT

P.O. BOX 1439 TULSA 1, OKLA.

OFFICES: DENVER, COLORADO TULSA, OKLAHOMA

HERE'S ANOTHER REASON WHY STEWART & STEVENSON IS THE NATION'S LARGEST DISTRIBUTOR OF GM DIESEL ENGINES



Woody Nobles, Pronto Toolpusher, stands beside the General Motors 6-110 Diesel Engines which are compounded to a Gardner-Denver 7¼ x 11 mud pump on a Pronto Drilling Company rig.

"IN MY THIRTY YEARS OF EXPERIENCE IN THE OILFIELD, I HAVE NEVER SEEN SERVICE AS GOOD AS THAT OF STEWART & STEVENSON"- LEE MINTON, PRONTO DRILLING COMPANY

Nearly four years ago, Pronto Drilling Company powered this Emsco GA-250 with General Motors Diesel Engines from Stewart & Stevenson, including the auxiliary pumps and light plants. During the life of the rig, it has drilled an unusual number of wells (more than 300,000 feet) with a minimum of down-time. Lee Minton gives much of the credit for his low down-time record to the excellent service from Stewart & Stevenson branches.

Service to the customer is the rule we live by at Stewart & Stevenson Services . . . because we feel that engines are only as good as the parts and service organization behind them. Good service is just one reason why Stewart & Stevenson is the Nation's largest distributor of GM Diesel Engines. Here is another: Stewart & Stevenson has the greatest backlog of experience in engineering, more different types of diesel and gas engine applications than any other engine distributor. When you need any kind of oilfield power, call Stewart & Stevenson. There's a branch less than two hours from your operations.

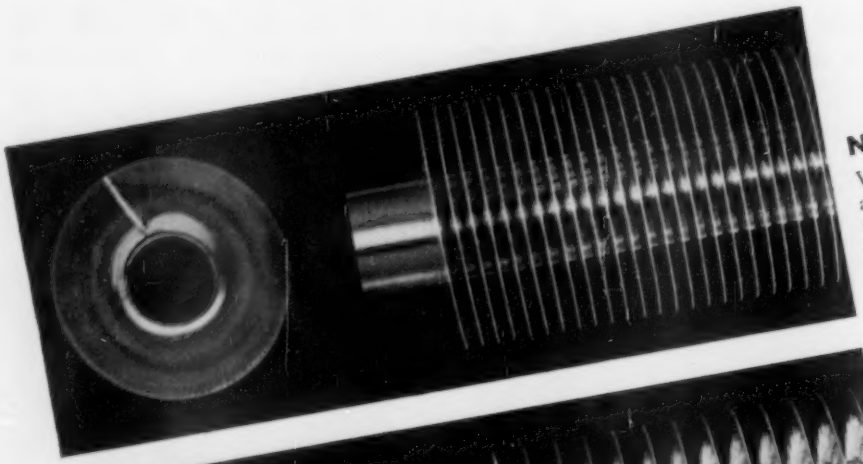
STEWART & STEVENSON SERVICES, INC.

CHRYSLER GM climax

Main Office and Plant:	4516 Harrisburg Blvd., Houston 11, Texas. Phone WOodcrest 9691.
Branches:	Corpus Christi, Dallas, Lubbock, Wichita Falls, San Juan, Odessa.
Representatives:	San Antonio, Longview, Brownsville.
Distributors of:	General Motors Diesel Engines, Climax Blue Streak Engines, Chrysler Industrial and Marine Engines, Petter Diesel Engines.
Fabricators of:	Electric Power Units, Electrical Control Equipment, Portable Pumping Units, Red Head Pumps.

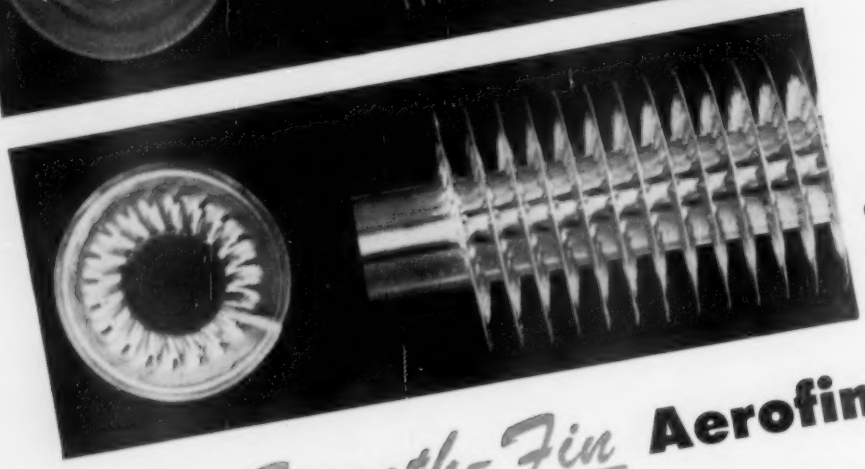
PARTS • SERVICE
STEWART & STEVENSON SERVICES
ANYTIME • ANYWHERE

THE NATION'S LARGEST DISTRIBUTORS OF GM DIESEL ENGINES



New Smooth Fins

Wide base provides ample contact surface. Smooth fins can be closely spaced without increasing resistance.



Old Type Fins

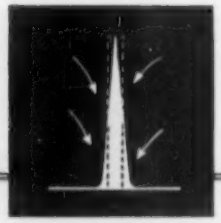
Crimped to provide necessary contact surface, widely spaced to reduce air friction.

NEW *Smooth-Fin* Aerofin Coils
for Greater Capacity— Lower Resistance

Aerofin extended-surface heating and cooling coils now offer you an even greater area of effective surface — even greater capacity — per square foot of face area. Airway resistance is lowered; higher air velocities can be used. The result is extremely high heating or cooling capacity in a given space.

Compact, sturdy, standardized encased units arranged for simple, quick, economical installation.

Write for Bulletin S-55



The new Aerofin smooth fins are tapered, with wide base that conducts sufficient heat between fin and tube to make the entire fin effective transfer surface.

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

NEW DEVELOPMENT BY REPUBLIC RUBBER ALLOWS CONCENTRATED ACIDS TO BE SAFELY CARRIED IN RUBBER HOSE

Youngstown, Ohio—It is now possible to safely conduct concentrated acid solutions in rubber hose, the Republic Rubber Division of Lee Rubber & Tire Corporation announced recently.

Exhaustive field and laboratory tests show that Republic Acid Hose, with a tube containing Hypalon, will conduct concentrated acid solutions without deteriorating the hose.

Listed below are chemicals which can be safely handled by Republic Acid Hose with a Hypalon Tube:

Liquid Anhydrous Ammonia at Room Temperature.
Chlorine Dioxide—2 to 14% at 150° F.
Chrome Plating Solution at both R T* and 158° F.
Chromic Acid 50% at R T.* 158° F. and 200° F.
Chromic Acid Concentrated at R T.*
Hydrofluoric Acid 48% at R T* and 158° F.
Nitric Acid 10%.
Nitric Acid 70% at R T* to 122° F.
Nitric Acid Fuming Serviceable for 4 hours to 3 days.
Phosphoric Acid 85% at R T* to 200° F.
Potassium Hydroxide (Concentrated) at R T.*
Sodium Dichromate 20% at R T.*
Sodium Hydroxide 50% at R T* and 158° F.
Sulfuric Acid 10% at R T.*
Sulfuric Acid 40% at 150° F.
Sulfuric Acid 50% at R T* to 200° F.
Sulfuric Acid 60% at 158° F.
Sulfuric Acid 70% at 158° F.
Sulfuric Acid 80% at 158° F.
Sulfuric Acid 95.5% at R T.*

*Room Temperature

Republic is able to furnish Acid Hose with a Hypalon Tube in both Suction and Discharge Hose in a wide variety of sizes for use where a superior grade of Acid Hose is advisable from a safety, as well as economic, standpoint.

It was also stated at Republic Rubber that their engineers are working on problems involving other types of acids, and that they are willing to work on any special application that would help the industrial user.

DANGER! SULFURIC ACID

This tank truck, working at a leading southern phosphate company, is discharging 98% SULFURIC ACID through a hose manufactured by Republic Rubber —

REPUBLIC ACID HOSE

Here is the astounding truth —

The length of Republic ACID HOSE (with a Hypalon Tube) pictured above has conducted 98% Sulfuric Acid at rate of 3 tank cars a week FOR THE LAST FOUR MONTHS! The hose, after four months' service, was still in good condition but was replaced for safety's sake.

Previously, this southern company had used regular acid hose for only **one week**, or only 3 tank car loads, before replacement became necessary. The use of Republic Acid Hose with the Hypalon Tube lowered the cost of this operation by a substantial amount.

If you transfer acid via rubber hose, ask your local Republic Distributor to help you select the right Republic Acid Hose for your job. His name may be found in the Yellow Pages of your phone book, or write:

REPUBLIC RUBBER DIVISION
LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO
INDUSTRIAL RUBBER PRODUCTS

an ACCO product

You asked for it...NOW...here it is!

NEW

TRU-LAY VHS

Very High Strength Wire Rope

Sets New Service Records as ROTARY DRILLING LINES

Tru-Lay VHS tops all past standards by 15%!

Drills Deeper—With stronger VHS you can drill to a greater depth before increasing the number of parts of line.

More Ton Miles per Foot of Rope—New VHS is not only stronger, it's tougher . . . has greater resistance to abrasion and wear. Because of this, operators can safely extend the Ton Miles between cuts . . . get more Ton Miles per foot of rope.

Better Spooling on Drums—Tougher VHS resists deformation . . . keeps its shape for longer periods of service.

Higher Factor of Safety—VHS's increased breaking strength means a higher factor of safety during the entire period of service.

New VHS adds greater strength and toughness to the advantages of Tru-Lay Preformed construction. It saves you money by increasing service life and reducing "down time" for drilling line replacements.

Ask at your nearby Mid-Continent Supply store or write to the nearest American Chain & Cable Company office listed at right for Brochure DH-489

ACCO

American Cable Division
AMERICAN CHAIN & CABLE

Plants: Houston, Tex., Wilkes-Barre, Pa.
Offices and warehouses: Odessa, Tex., San Francisco, Portland, Ore., Pittsburgh, Philadelphia, New York, Los Angeles, Denver, Chicago, Atlanta · Bridgeport, Conn.

VHS 15% STRONGER

BALANCED

COUNTERBALANCED

Note that less line is needed at pick-up position on LeBus Grooved Drum. Plain drums usually require a layer and a half of line up to the pick-up point.

The line is crossing over in this photo as the line reaches the middle of second layer. Notice even spooling.

The line has reached the fourth layer and is still spooling smoothly and evenly onto the LeBus Grooved drum.

LEBUS GROOVING & COUNTERBALANCE CONTROL PYRAMID SPOOLING SYSTEM

Consult a LeBus Engineer for details or write

Just as Scientists have attained "perfect balance" and "smooth running" of a gyroscope so has LeBus Engineered their Grooving and Spooling System for "perfect balance" and "smoother operation." With the LeBus GROOVING AND COUNTERBALANCE CONTROL PYRAMID SPOOLING SYSTEM, the wire-line crosses over at two points on directly opposite sides of the drum and causes the line to become "Counterbalanced". Previously there was only one cross-over point on the drum at which the line would build up diameter, causing the drum to have a slightly "Out of Balance" condition which could set up "Vibration" at high speeds or when going into the hole. LeBus has practically eliminated all vibration with their new system and through this system they still control and hold the pyramid action of the line as it builds up on the drum. Evidence of "Perfect SPOOLING" is pictured (above).

*PATENTED and OTHER PATENTS PENDING

LeBus International Engineers, Ltd.

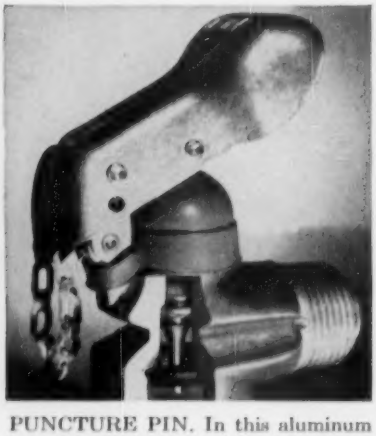
Executive Offices: 305 Wichita National Bank Building, WICHITA FALLS, TEXAS

Sales, Service Control and Warehouse Stock: LONGVIEW, TEXAS

Here's why Ansul extinguishers give you faster, more dependable fire protection!

READY for instant action under the most severe exposure conditions.

WEATHER-TIGHT NOZZLES made of aluminum and stainless steel, can't rust. Neoprene cap and oil-impregnated washers keep out moisture.



PUNCTURE PIN. In this aluminum housing a stainless steel pin pierces the gas cylinder that supplies the propellent power for the dry chemical.

PATENTED NOZZLES. Straight or fan stream, the hazard determines which is installed. An Ansul exclusive for more effective fire control.

FIELD RECHARGING. Just 4 minutes after a fire is extinguished your Ansul unit can be recharged, ready for action. No special tools are needed.

The pictures on this page tell half a story. The complete story includes Ansul's facilities for training your personnel in the science of fire control and prevention. Experience has taught us that *complete* fire protection demands *both*—fast, dependable equipment and trained personnel to man that equipment. Ansul can provide both. Get in touch with your local Ansul man, he has the complete story about *complete* fire protection.

Call the ANSUL MAN!

Get in touch with your local Ansul man through the "yellow pages," or write direct to ANSUL CHEMICAL COMPANY, Fire Equipment Division, Dept. F-91, Marinette, Wisconsin.

Write Ansul for your copy of New Fire Equipment Catalog.

ANSUL

Balance, too, is important in

COOLING TOWERS

In the new CW SERIES COOLING TOWERS Marley engineers have achieved a high performance level that takes these counter-flow towers out of the "conventional" class. A carefully balanced expansion of three major elements results in more cooling ability for every frame size. CW towers offer:

GREATER FILL VOLUME – with more wetted surface in each cubic foot

GREATER AIR VELOCITIES – more pounds of air to pick up heat

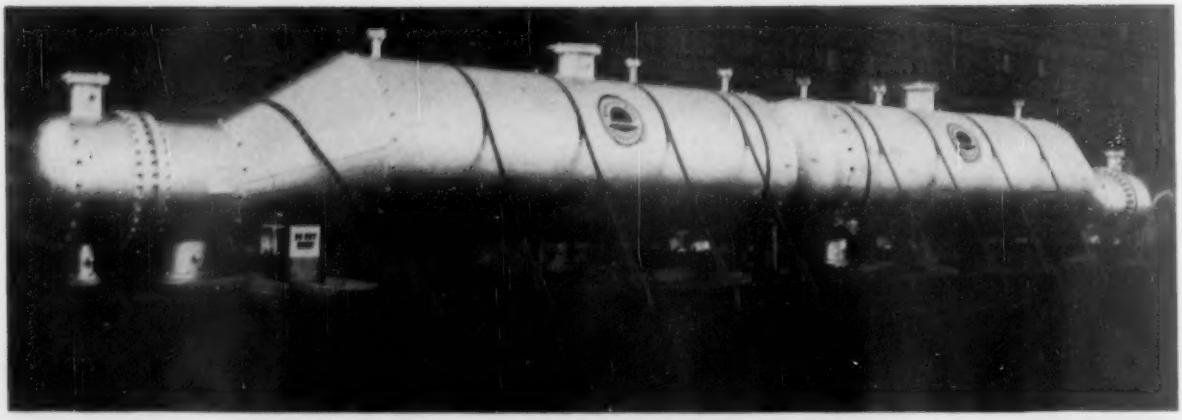
GREATER SPRAY BREAK-UP – high pressure down spray on closer centers

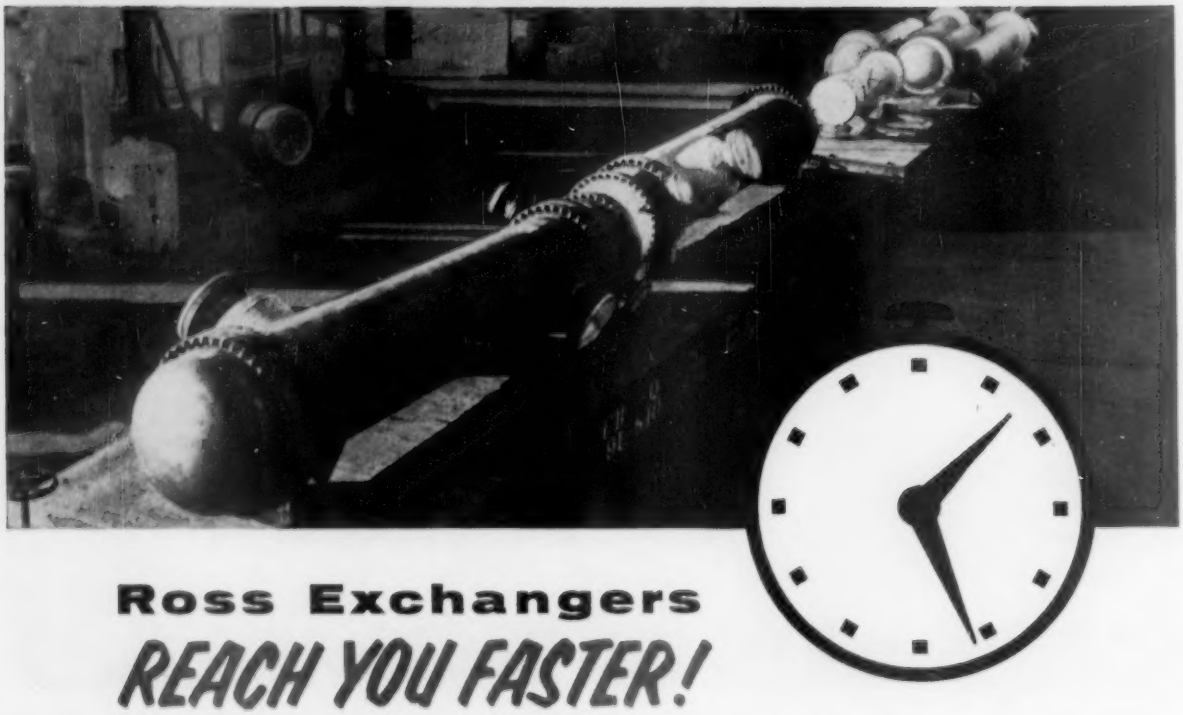
There is the correct amount and type of fill to balance the increased air velocity; proper spray pressure to perform adequately with added fill and air flow. Of greatest importance is the skillful integration that makes the expanded features perform at a new low cost per gpm. This balance carries through to the fan, Geareducer, fan cylinder and drive shaft, all Marley designed to function as a unit at higher velocities for longer life.

MARLEY

The Marley Company

Kansas City, Missouri





Ross Exchangers
REACH YOU FASTER!

Leaving the Kewanee, Ill. works, these Ross Exchangers and Kettle Type Reboilers will travel the shortest possible routes to their new owners. Naturally!

But that's merely a matter of days or hours . . . hardly enough to talk about when one considers the time that Kewanee-Ross can often by-pass in engineering and fabrication.

Yes, it's a fact that Ross Exchangers and Condensers can stop the clock . . . *in a number of ways* . . . from the time you first consult with a Kewanee-Ross engineer until your product is delivered. (1) A great variety of standardized designs, in numerous sizes, often provide immediate solutions. (2) No matter how individualized, specially engineered units can frequently utilize many standard components and design features. (3) Unique experience over many years, in meeting greatly diversified requirements, is bound to include a "case" that closely parallels yours.

Make sure that your next exchangers and condensers reach you faster by consulting Kewanee-Ross early.

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1417 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

ROSS

Serving home and industry: AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

MORE EFFECTIVE FRACTURING

Coming soon - Western's specially "matched" fleet for fracturing

WITH UP TO 50%

CASH SAVINGS!!!

Control-frac

WESTERN CONTROL-FRAC with fluid-loss control and viscosity control gives more effective fracturing and saves you money these ways:

1. Gives you benefit of complete volume of fracturing fluid — deeper radius of fracturing.
2. Causes less dependency on high injection rates — therefore, less pump costs.
3. Control-frac treatments usually require less fluid — therefore, less fluid expense.
4. Lets you use your lease crude with complete effectiveness — another big economy feature.

These benefits along with CONTROL-FRAC'S viscosity control, plus Western's tailored treatments for individual wells, bring you safer, more effective fracturing with up to 50% cash savings. Ask a Western Engineer to show you case histories from Western's files. See how WESTERN CONTROL-FRAC can answer your fracturing problems.

WESTERN CONTROL-FRAC . . . the FIRST frac fluid with fluid loss control and/or viscosity control.

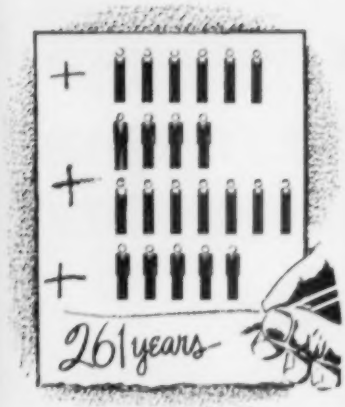
Engineered Well Services
Acidizing
Fracturing
Perforating
Jet and Bullet
Gammatron
Radioactivity
Well Logging

THE WESTERN COMPANY

General Offices
Midland, Texas

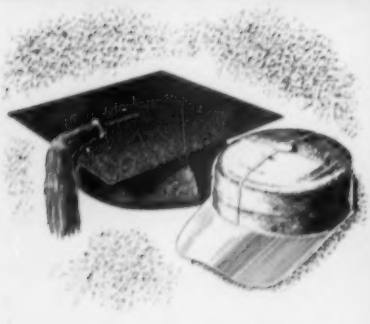
WESTERN
Engineered
WELL SERVICES

Things That Money Can't Buy!

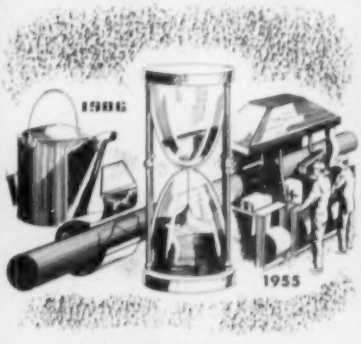


STICK-TO-IT EXPERIENCE

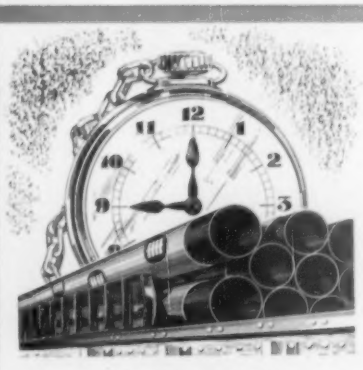
'ROUND THE CALENDAR DEPENDABILITY



TWO-WAY ABILITIES



PIONEER'S KNOW-HOW



ON TIME SERVICE

IN EVERY INDUSTRY there's a leader with certain intangibles that tip the balance between superior and mediocre results. In the pipe-protection industry that leader is Hill, Hubbell & Company—and the intangible "things that money can't buy" add up to a superior type of service which can come only from longer experience and technical knowledge. This pioneer's know-how . . . *in addition* to the most modern processes and equipment . . . keeps Hill, Hubbell well out in front.

HILL, HUBBELL and COMPANY

Factory Applicators of Pipe Coatings and Wrappings

DIVISION OF GENERAL PAINT CORPORATION

3091 Mayfield Road • Cleveland 18, Ohio

LEADER IN PIPE PROTECTION FOR MORE THAN A QUARTER CENTURY

SPANG
EXTREME LINE
CASING

SPANG
EXTREME LINE
TUBING

SPANG
DOUBLE SEAL
SHRINK THREAD DRILL PIPE

SPANGWELD
DRILL PIPE

SPANGSEAL
TUBING

Their quality pays off in the well!

The quality you find in every one of these SPANG Tubular Products pays off in the well by reducing failures and costly downtime. Length after length, string after string, their stamina is proved under every kind of operating condition. Your experience with each of these products has built their respective reputations for top performance. We constantly guard these reputations with continuing research, improved manufacturing techniques and an oil country service policy based on complete customer satisfaction.

This consistent policy over the years is one of the reasons why National is the oil industry's largest supplier . . . and its tubular products recognized as the most dependable you can buy.

THE
NATIONAL SUPPLY
COMPANY

If you're having these tubing troubles*...

TENSION from longitudinal loading

COLLAPSE from unbalanced internal pressure

THREAD FAILURES from shock or vibration fatigue

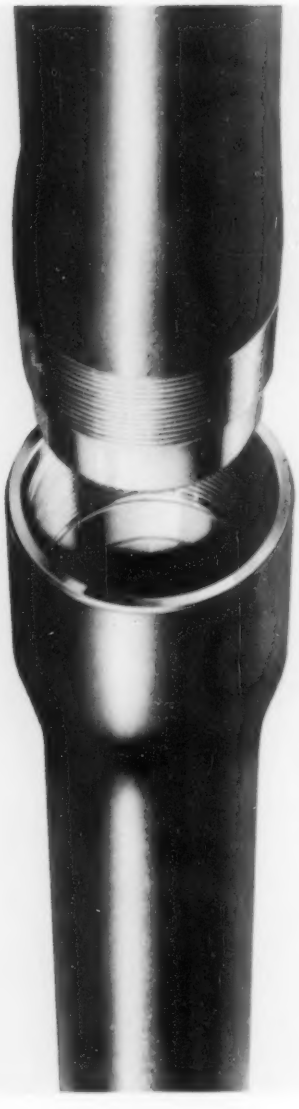
LEAKAGE through the threaded connections

CRUSHING by slips and tongs

WEAR from rods

BUCKLING from mechanical forces or internal pressure

CORROSION—hydrogen sulphide, oxidation, condensate, electrolytic and galvanic



You'll get maximum corrosion resistance when you specify a multiple coat, baked phenolic plastic coating that can be applied at the mill on all SPANG Tubing. Ask your National representative about this service—and any other information you'd like to have about this quality tubing.

. . . . you can minimize them with high quality

SPANG® EXTREME LINE® TUBING

- Provides maximum running speed; fast joint make-up
- Has 100% joint strength
- Provides 100% resistance to leakage
- Has 50% less connections
- Provides positive shoulder contact engagement
- Has a streamlined exterior
- Is available in grades J-55, N-80 and P-105 to suit every well condition

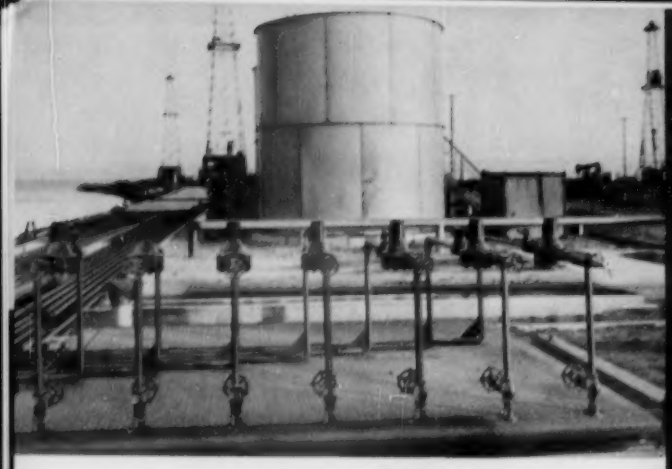
SPANGSEAL® TUBING

- Has 50% less connections
- Provides 100% resistance to leakage
- Provides more hole clearance
- Eliminates "hanging-up" while running
- Is available in grades J-55, N-80 and P-105 to suit every well condition

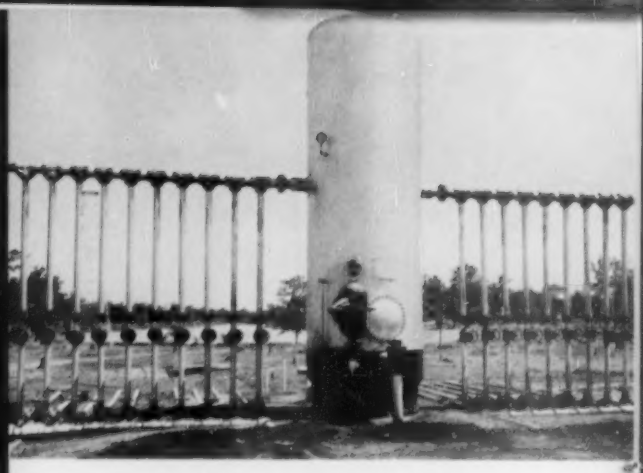
THE NATIONAL SUPPLY COMPANY

SPANG-CHALFANT DIVISION
MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; Toledo, Ohio; Tulsa, Oklahoma; Calgary, Alberta, Canada
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

See the next page for information on another important SPANG tubular product . . .

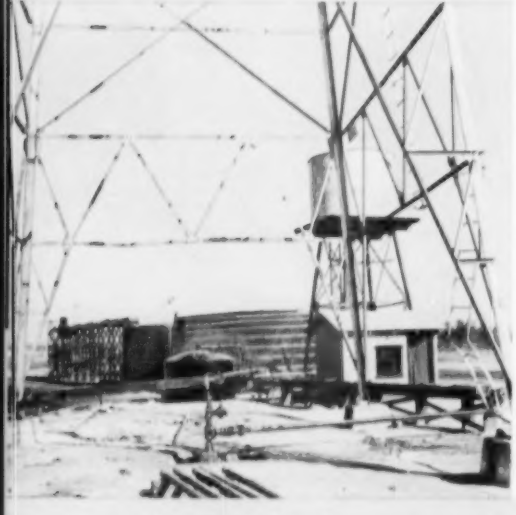


for high pressure surface lines



for low pressure separation lines

for roof rails and exhaust lines



for water flooding lines

. . . and for trouble-free service, wherever you need steel pipe,

specify SPANG® CW

In these, and dozens of other oil field applications, SPANG CW Steel Pipe has consistently proved itself as a top-quality pipe for general service work.

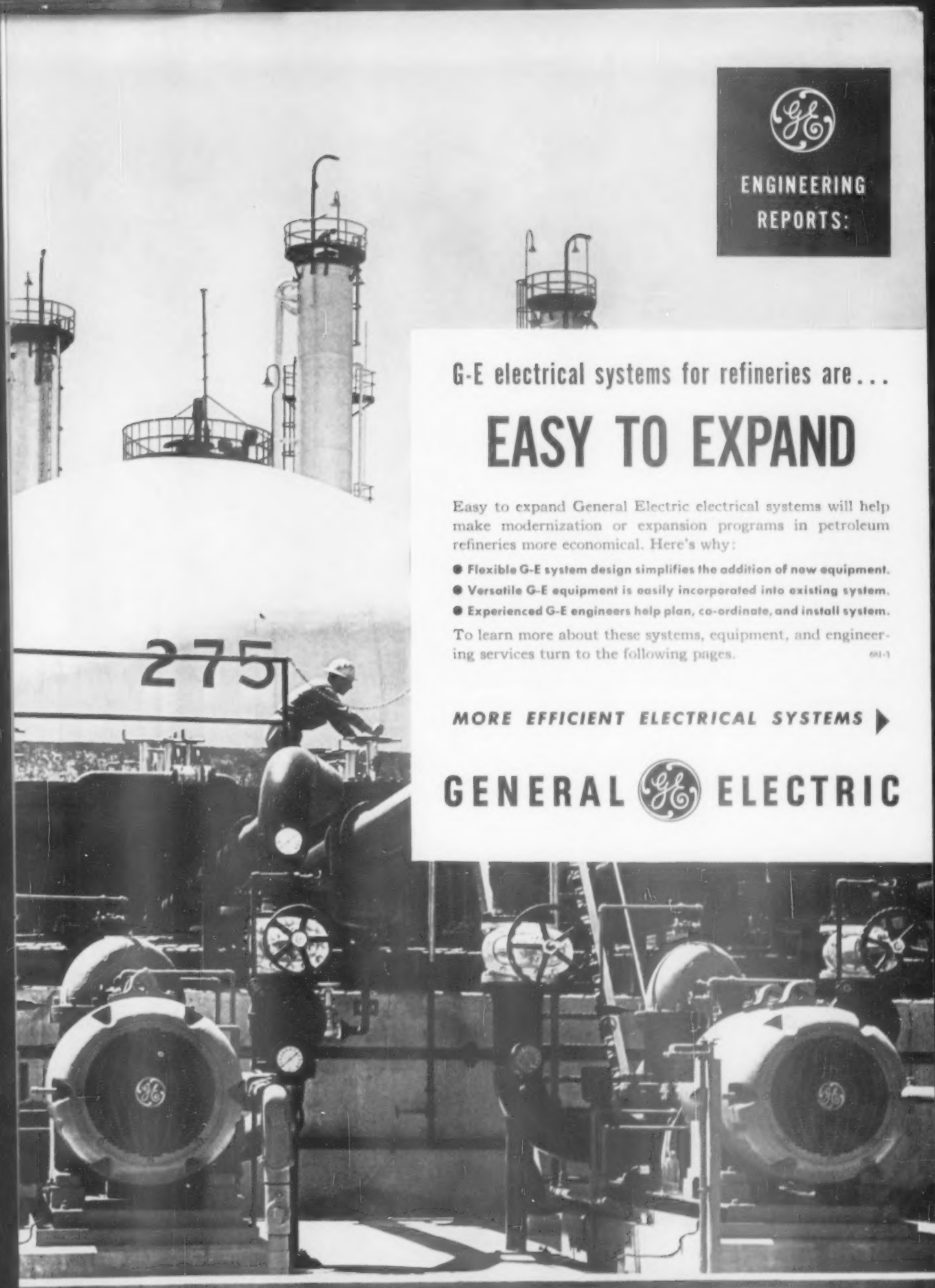
That's because it's made under close quality control conditions—like all the other famous SPANG oil field tubular products. The manufacturing care behind SPANG CW makes it easy to work with and install. Thorough tests and inspections before shipping insure its top strength and long service life—features that pay off wherever you put it to work.

SPANG CW costs no more than pipe produced under less exacting conditions, so why not try it on your next job? You'll find it available at all National Supply Stores.

THE NATIONAL SUPPLY COMPANY

SPANG-CHALFANT DIVISION
MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; Toledo, Ohio; Tulsa, Oklahoma; Calgary, Alberta, Canada

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT



ENGINEERING REPORTS:

G-E electrical systems for refineries are . . .

EASY TO EXPAND

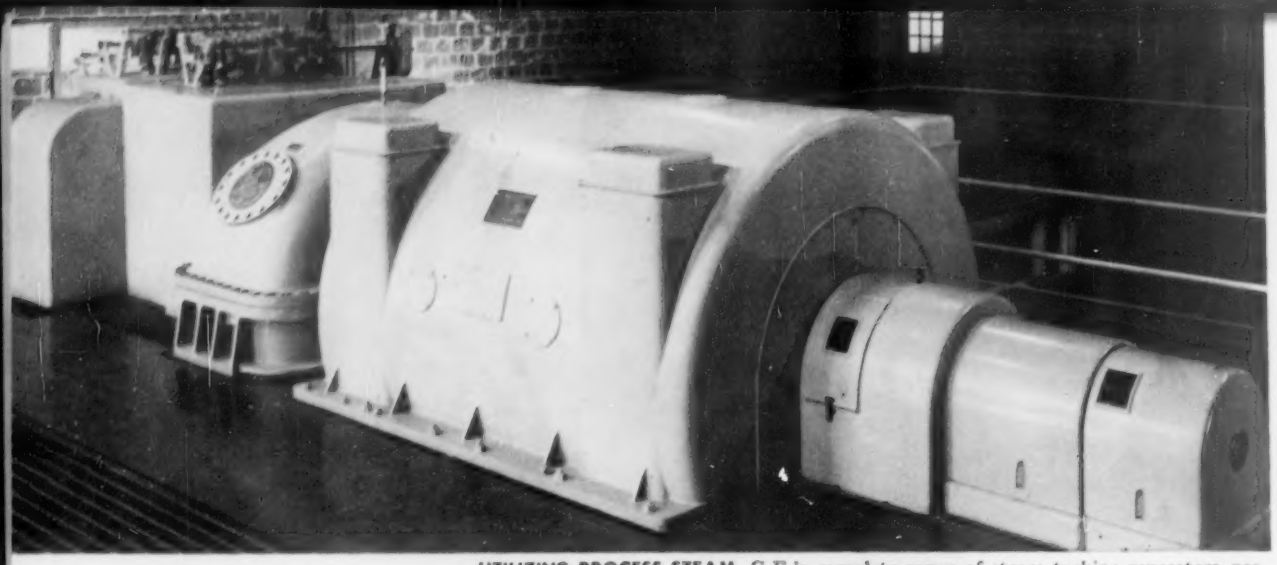
Easy to expand General Electric electrical systems will help make modernization or expansion programs in petroleum refineries more economical. Here's why:

- **Flexible G-E system design simplifies the addition of new equipment.**
- **Versatile G-E equipment is easily incorporated into existing system.**
- **Experienced G-E engineers help plan, co-ordinate, and install system.**

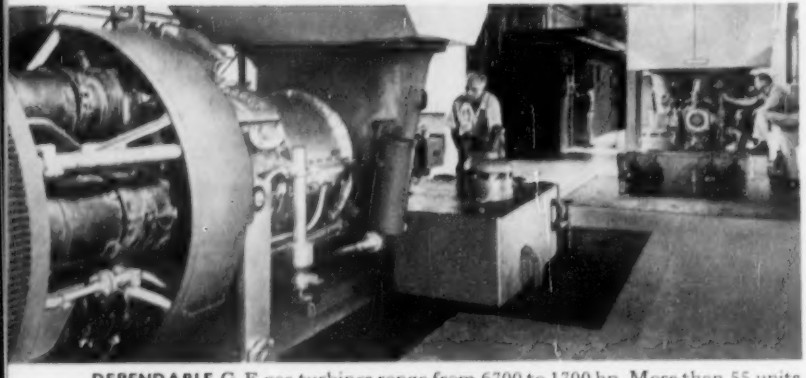
To learn more about these systems, equipment, and engineering services turn to the following pages. 681-1

MORE EFFICIENT ELECTRICAL SYSTEMS ▶

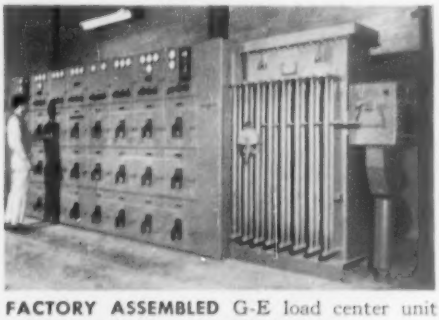
GENERAL ELECTRIC



UTILIZING PROCESS STEAM, G.E.'s complete range of steam turbine-generators provide electric power as a by-product, help maintain plant steam balance.



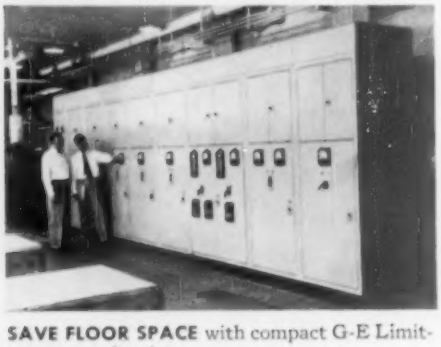
DEPENDABLE G-E gas turbines range from 6700 to 1700 hp. More than 55 units utilize exhaust heat for power generation and mechanical drive applications.



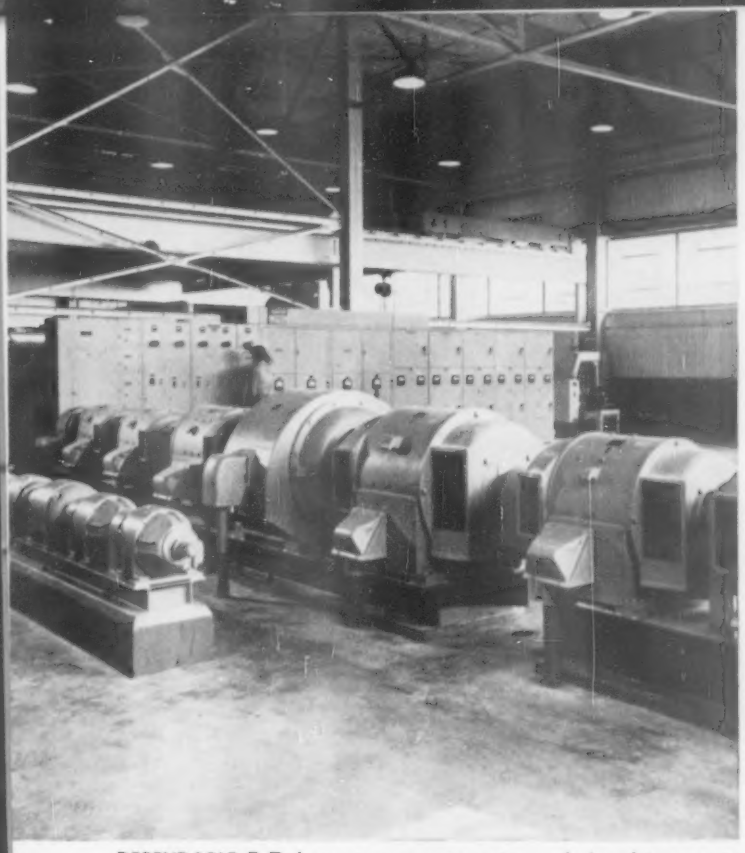
FACTORY ASSEMBLED G-E load center unit substations help cut installation time.

COMPLETE, COMPACT, G-E motor control centers provide centralized control in load areas.

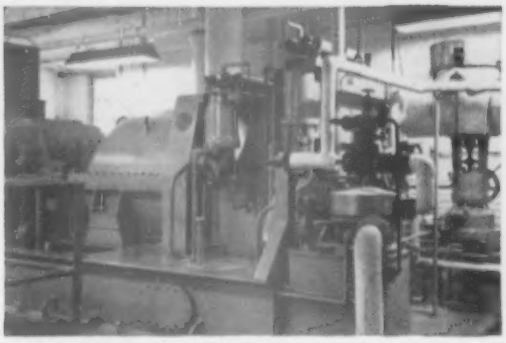
MORE RELIABLE POWER DISTRIBUTION is available with G-E package substations which use co-ordinator transformers, metal-clad switchgear.



SAVE FLOOR SPACE with compact G-E Limit-amp control units.



DEPENDABLE G-E d-c motor generator sets are designed to operate in continuous service at top efficiency. Minimum of maintenance is a key feature of these sturdy generators built for long life.



ECONOMICAL MAINTENANCE is a key feature in design of G-E mechanical drive turbines.

RUGGED CONSTRUCTION of G-E Tri-Clad* motors make them ideal for all types of drive operations. Polyex insulation in motors 100-3000 hp gives 50% longer motor life.

*Reg. Trademark of General Electric Co.

G-E engineering services, equipment can give you . . .

More efficient electrical systems

MODERNIZING, EXPANDING, BUILDING? Whatever your plans, let experienced G-E engineers help plan a more efficient electrical system for you. They will work with you or your engineering contractors to give you correct answers to the following questions.

SHOULD YOU GENERATE OR PURCHASE POWER? G-E engineers will help make a "load" survey of your facilities, and recommend an economical solution to your particular power supply problem.

WHAT TYPE ELECTRICAL DISTRIBUTION SYSTEM SHOULD YOU INSTALL? The latest distribution system concepts will be reviewed with you by G-E engineers. They will help select and design a modern system to meet your individual requirements.

WHAT KIND OF DRIVE EQUIPMENT SHOULD YOU USE? Each application for drives in your processing lines will be individually examined by G-E engineers to assure that the proper drive is designated for the job.

WHERE CAN YOU UTILIZE AUTOMATIC CONTROLS? New developments in the field of automatic controls will be applied throughout your processing lines by G-E engineers.

Let your General Electric Apparatus Sales Representative get you detailed answers to these and other electrical questions. Contact him at your nearest G-E Apparatus Sales Office early in your planning stages. General Electric Company, Schenectady 5, N. Y. 681-3

PROTECT YOUR EQUIPMENT INVESTMENT ▶

Engineered Electrical Systems for Process Industries

GENERAL ELECTRIC

SIX G-E ENGINEERING SERVICES . . .

HELP YOU PROTECT YOUR EQUIPMENT INVESTMENT

1 **G-E APPLICATION ENGINEERING** helps you and your consultants design the right electric system for your plant.

2 **G-E ANALYTICAL ENGINEERING** helps attain the optimum electrical system for your application. Engineering experience backed up by electronic system analyzers save valuable design time.

3 **G-E PRODUCT DEVELOPMENT** laboratories design and test new equipment under tomorrow's conditions to meet your future demands.

4 **G-E FIELD-SERVICE ENGINEERING** helps you supervise installation, expedite start-up of your major electric equipment.

5 **G-E MAINTENANCE SERVICE** from 31 G-E Service Shops will repair and uprate your old equipment, help establish productive maintenance of your equipment, furnish emergency service.

6 **G-E PROJECT CO-ORDINATION** means on-time engineering, shipment, instal'ation of your electric equipment from preliminary diagrams through start-up.

These valuable services are available to you with General Electric equipment. Contact any General Electric Apparatus Sales Office. Meanwhile, for the full story of G-E engineering services, write for brochure GED-2244, General Electric Co., Sect. 681-3, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

STARCH...
For The Oil and Gas Journal

We have been talking about the joint responsibility which our advertisers share with our editors in building readership in The Oil and Gas Journal. We would be remiss if we, in turn, did not provide every possible assistance to help our advertisers improve the copy which they run in our publication.

Quite logically, therefore, we provide the Journal as the laboratory in which Starch continuing readership studies on certain advertising appearing in The Oil and Gas Journal may be made. You may communicate direct with Daniel Starch & Staff, Mamaroneck, N. Y., or to us, if you wish to be included in this program. We are pleased that The Oil and Gas Journal has been selected as the only publication in the petroleum field to provide this service. We regard it as an obligation of leadership which we are glad to assume.

We will continue to work in every way possible on the improvement of our editorial pages; and as our advertisers continue their effort to improve the copy which they run in our publication we will all benefit—because remember—"The Reader is The Most Important Man to Both of Us."

The PETROLEUM PUBLISHING COMPANY
211 So. Cheyenne • Tulsa, Oklahoma

ALSO PUBLISHERS OF: PETROLEO INTERAMERICANO *and* OIL AND GAS EQUIPMENT

Simple New ROLOCHECK Meter

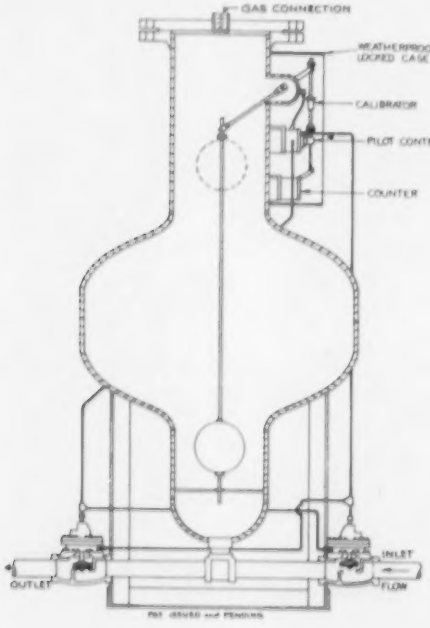
Reduces Measurement Costs . . . Increases Profits
Eliminates Separator Liquid-Level Controls . . .

The thoroughly field tested new ROLOCHECK oil well meter measures crude at the separator on the lease, and automatically dumps a positive calibrated dump each time with high degree of accuracy. Unaffected by gas, the Rolocheck functions equally well with high amounts of foreign matter present, thus eliminating expensive maintenance problems usually caused by gas, sand and other solids in crude oil.

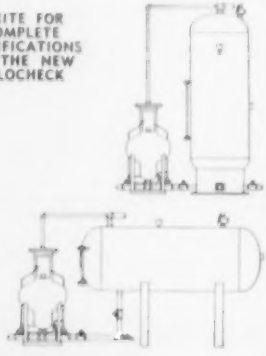
In the representative field installation above, a battery of Rolocheck meters are used to compute for royalty payments where individual well production is metered into common stock tanks.

Simple in design, positive in accuracy, the Rolocheck has a high maximum rate, zero minimum rate, and is available in 150, 300, 500, 600 and 1200 psi working pressures, 18", 24", 30" and 42" diameters, with ¼, ½, 1 and 2½ barrels per dump capacities. Up to 4000 BPD capacities, with higher capacities and working pressures available if required.

The Rolocheck functions equally well when installed on horizontal or vertical separators or a heater-treater, the only difference being in piping layout and height of meter.



WRITE FOR COMPLETE SPECIFICATIONS ON THE NEW ROLOCHECK



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ROLO MANUFACTURING COMPANY

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EXPORT OFFICE: R. S. Stokvis & Sons, Inc., 17 Battery Place, New York, N. Y.

They Say—

Big Leaguer Overlooked

Dear Sir:

On page 280 of your April 4 issue there is a glaring omission. There is no mention of the "Best and Finest"—The University of Tulsa. I know other magazines and towns resent the respect and honors earned by "The Oil School," but I never thought you would forget . . .

I suppose your researcher couldn't see the forest for the trees, but this type of omission is like leaving the Yankees out of the major league rosters in the baseball register.

I enjoyed the remainder of this particular issue very much and feel that the issue is up to your usual top standards except for the omission.

Ellis T. Hammett
Alamo, Tex.

Editor's Note: Sincere apologies. The University of Tulsa certainly is a member of the big league in oil circles.

Wants More Classifiers

Dear Sir:

I was very impressed with your supplement Oil & Gas Field Classifier (April 4 issue) which cast a very illuminating picture on the problems we are faced with in the opening up of the St. Lawrence lowlands as a prospective oil and gas field. There is a very active program of exploration now being carried out and the work of the next season should show some results.

Would it be possible for me to order half a dozen copies of the classifier. I should like very much to let our provincial geologists have copies. There has been some doubt among the official geologists about the lowlands region, which is essentially an ancient delta . . . I think your classifier will do much to convince them of the possibilities . . .

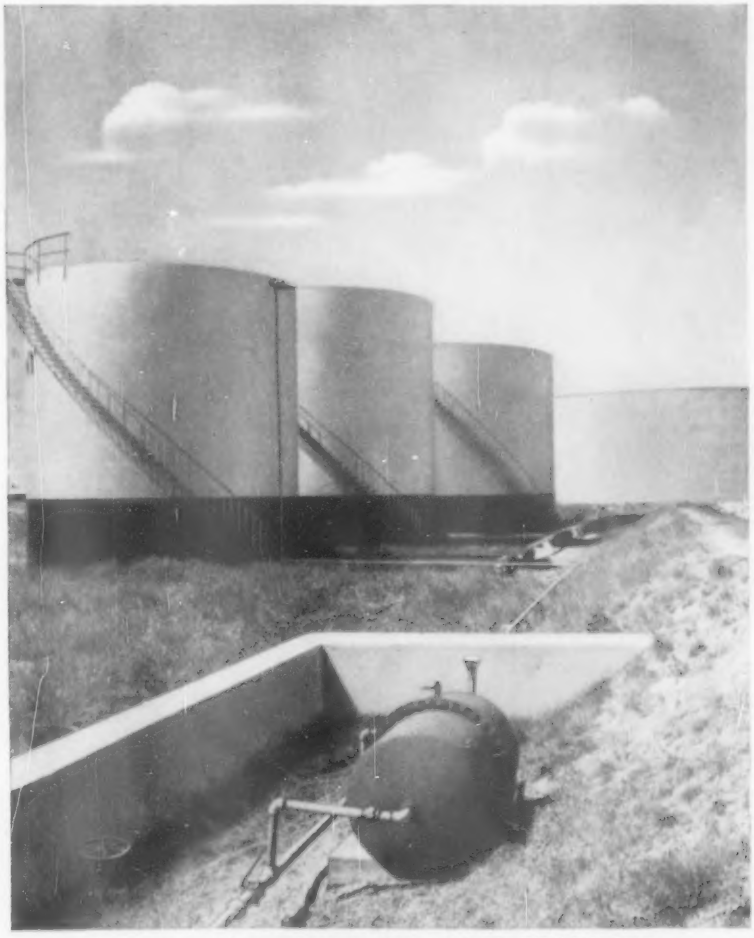
Congratulations on a first-class exposition in the simplest possible terms of the oil and gas producing structures.

Edmund Fancott
President
Oka Oil, Ltd.
Montreal.

Photog Item In Demand

Dear Sir:

We certainly enjoyed reading the item by Henry D. Ralph in the April 11



Shown in foreground is operating unit of Rockwood SpotPROTECTION System protecting oil storage at SOUTHWEST OIL REFINERY.

New Way to Protect a Danger Spot

The tank in the foreground is compact but powerful in action. It can stop a fire that could destroy a fortune.

Rockwood now offers you a *compact*, moderately priced, yet *complete* unit, expertly engineered to snuff out fires instantly. Rockwood's storage and automatic proportioning system, an exclusive patented feature, make this compact unit an eveready watchdog to protect your property, lives and continuing business.

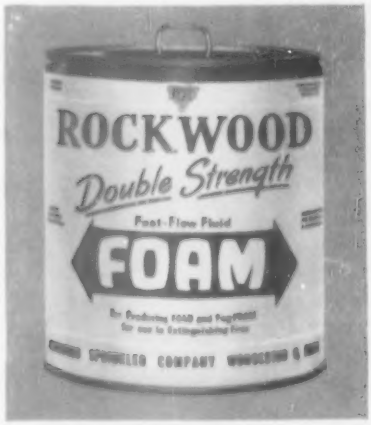
Here's how it works. The tank contains Rockwood FOAM liquid which, in an emergency, is automatically proportioned into the water. This mixture is then discharged from jet-action Rockwood's Double Barrelled FOAM Maker Chamber onto the surface of the burning oil — forming a fast flowing blanket of FOAM. This blanket covers the fire and strangles it.

Danger "spots" can result in loss of lives, money and property. Save these with SpotPROTECTION from this new compact, moderately priced unit. Is there a danger "spot" on your premises? Don't leave it unprotected. Find out how Rockwood can engineer water to cut fire losses for you.

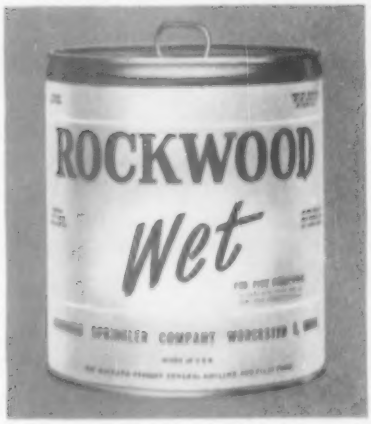
ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

How Rockwood Engineers Water to Cut Fire Losses



Rockwood Double Strength Foam clings to metal surfaces as an insulator, flows freely at sub-zero temperatures. Excellent for extinguishing fires in gasoline, benzol and other highly volatile liquids as well as ordinary combustibles.



Rockwood Wet makes water go farther. One part of Wet mixed with 99 parts water, increases penetration and extinguishing action of water. A "must" for deep seated fires and where water is scarce. Helps reduce amount of time and manpower.

SEND FOR THIS INFORMATIVE BOOKLET

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
365 Harlow Street
Worcester 5, Mass.

Please send me your illustrated booklet on Rockwood fire-fighting products.

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Company _____

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High in strength because they are high in quality, Guiberson Seal-O-Matic Unions are rugged, heavy duty couplings that stand up to the severest tests.

Double-sealing Seal-O-Matic Ring and metal to metal seat hold working pressures securely. Seal-O-Matic Ring is molded from special oil resistant compound that will not deteriorate in oil, gas or under pressure. All metal parts are made of high tensile alloy steel, accurately machined to assure interchangeability.

Quick and easy to make or break, Seal-O-Matic Unions are ideal for a multitude of uses ...with minimum upkeep and positive, leak-proof seal.

SEAL-O-MATIC UNIONS ARE AVAILABLE IN FOUR PRESSURE RATINGS
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CORPORATION
ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.
Sold By Leading Oil Field Supply Stores Everywhere

Regular Unions have line pipe thread. Also available in EUE 8 round thread.

issue of The Oil and Gas Journal regarding R. B. Ward. We sincerely think that Mr. Ward deserves the excellent writeup you gave him in the Journal. For many years, Mr. Ward has made photographs for our company throughout the petroleum fields and refineries, and we must admit that Mr. Ward's photographs have been some of the best photographs that we have ever obtained.

May we have your permission to reprint the article regarding Mr. Ward in our company magazine, The Water Tower? We would like to let our readers know something about the man who has made many of the photographs that have appeared in our magazine. . . .

E. N. Zimmerman
Chicago Bridge & Iron Co.
Chicago

Editor's Note: The Oil and Gas Journal and its staff photographer, R. B. Ward, are delighted to pass permission to Chicago Bridge & Iron Co. for use of the writeup in CB&I's Water Tower.

Finest in the World

Dear Sir:

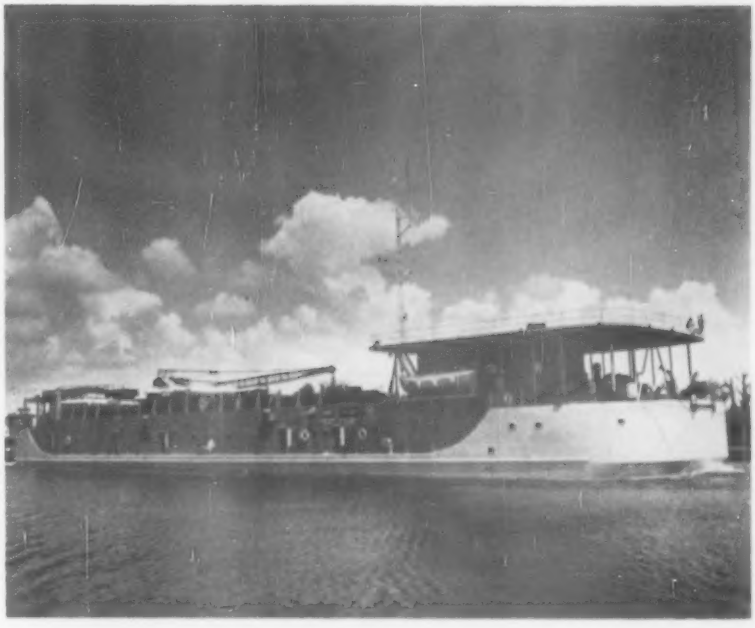
May I take this opportunity to tell you how very much "The Big Yellow Book" is appreciated and admired by myself and by the many other employes of Kent Oil Refinery, Ltd., who read it after me. Surely the world's finest magazine! Congratulations too on your new covers and internal layout—great improvements.

J. A. F. Stone
Hornchurch, Essex, England

Reserves and Demand

"How do our reserves compare to changes in demand? In the last full prewar year, 1940, our reserves of petroleum liquids were 14.3 times as great as then current demand. In 1946, the ratio declined to 12.1. There was a further decline in subsequent years, and in 1954 . . . the ratio was only 11.7.

"When I related reserves to demand rather than crude-oil production, it was not a slip of the tongue. I have done so advisedly. In the pre-World War II days there was not much difference between total demand and domestic production. But since 1946 there has been an increasing gap between the two which was caused by rapidly growing imports of crude oil and refined products. In 1946, total imports constituted 8 per cent of U. S. crude production and 7.1 per cent of total demand. In 1954, imports were equivalent to 16.6 per cent of domestic production and 13 per cent of total demand. In volume, imports expanded



The Levingston Shipbuilding Company of Orange, Texas, long known for its construction of fine tugs and barges, is proud of the reputation it has gained as "The Oil Industry's Shipyard."

Levingston is a pioneer in the development and construction of Submersible Drilling Barges and Compressor Stations and is now also engaged in the construction of offshore equipment for the Oil Industry.

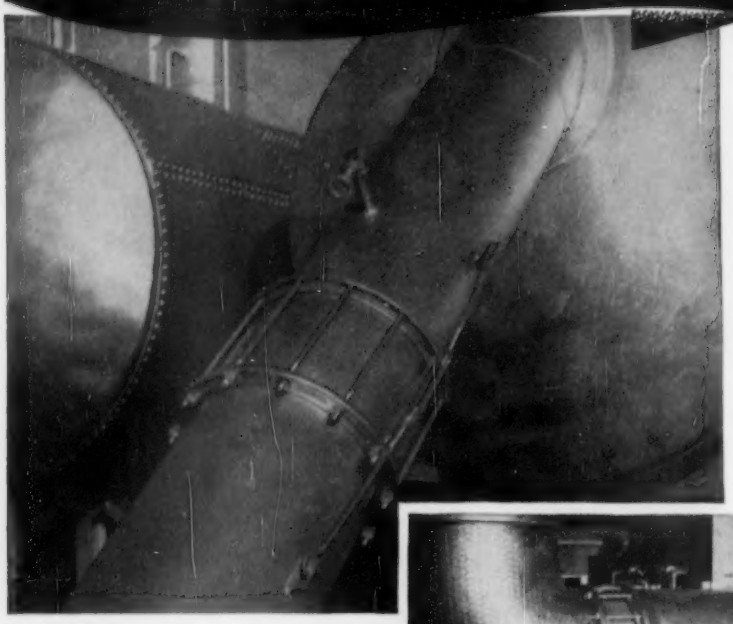
Pictured here is one of several Offshore Drilling Tenders constructed by Levingston to date.

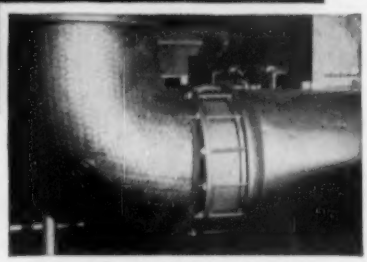
Levingston

SHIPBUILDING COMPANY
"THE OIL INDUSTRY'S SHIPYARD"
ORANGE, TEXAS

DRILLING BARGES • COMPRESSOR BARGES
DRILLING TENDERS and OFFSHORE EQUIPMENT

on equipment hookups... the DRESSER way is easier...surer!





TOP—20" Style 38 Dresser Coupling installed on field gas scrubber line. BELOW—24" coupling in gas-treating plant.

On machinery and tank hook-ups—at the well or anywhere in-between—the handiest, surest way to get uniformly tight pipe joints is with Dresser Couplings or Long Sleeves.

There's no pipe threading—the only tool you need is a wrench. Dresser Couplings give you bottle-tight connections every time—day or night, rain or shine—even when pipe ends don't meet.

AVAILABLE AT LEADING OILFIELD SUPPLY STORES

Style 38 Coupling | Style 40 Long Sleeve | Hydrepair* Asbestos Cement Pipe Clamp | Style 63 Expansion Joint | Style 39 Insulating Coupling

*HYDREPAIR is a trade-mark of Dresser Manufacturing Division

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When you need equipment for your next well, call your Union Tank sales and service man. DAY OR NIGHT, his years of experience are available to help you solve the production equipment problems on your leases. This service, combined with dependable Union Tank production equipment means a more profitable operation to you. That's why it will pay you to know the following men:

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Vertical separators	Valves and regulators
Horizontal separators	Loading racks

UNION TANK AND SUPPLY COMPANY

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Subsidiary of Butler Manufacturing Company
Kansas City, Missouri

from 377,000 bbl. daily in 1946 to 1,052,000 bbl. daily in 1954.

"The development of new reserves and a very rapid expansion in production abroad, particularly in the Middle East, had another effect on our domestic situation. Crude oil and products from foreign sources have been backing out U. S. exports of petroleum to an increasing extent. This naturally contributed to a slower rate of growth in total demand.

"Two conclusions suggest themselves . . . (1) we have been increasing the short-range availability of oil from domestic sources at a more rapid rate than the result of the exploratory efforts justified; and (2) to make matters worse, we have been bringing in foreign oil in quantities which have been generally recognized as being excessive . . ."

L. F. McCollum, president, Continental Oil Co., in a speech in Los Angeles before the Pacific Coast district of the Division of Production of the American Petroleum Institute.

Would You Take the Risk?

"The first reaction of the producer (operating under federal control) will obviously be not to take the risk involved when the return is unknown. It will be particularly burdensome and immediately so to the small producers, and bear in mind that the small producers find more than 75 per cent of the new fields discovered each year.

"This dampening of drilling and wildcatting will immediately result in declining reserves of gas to meet the skyrocketing national demand.

"Test it on yourself. Would you as an individual risk your money in such great quantities and at such long odds if you had no idea of the reward you might receive, or . . . if you were told that you had to take the reward but that you had no influence or control on what it might be?"

Harry G. Fair, vice chairman of the Phillips Petroleum Co. operating committee, in an address before the Denver meeting of the Rocky Mountain district of the Division of Production of the American Petroleum Institute.

Where Gas Will Go

"If the decision (in the Phillips case) stands, the inevitable trend will be to divert gas from interstate markets to those located in the states where the gas is produced, chiefly in the southwest . . . This great natural resource is in jeopardy at least so far as northern consumers are concerned.

"I assure you that it was not our interest to subject the independent gas producer to federal control. We wrote into the (Natural Gas) Act that it

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PRICELESS

"Buffalo" Type "EWC" Evaporative Water Cooler with Recirculating Dampers for Automatic Temperature Control.

"Buffalo" TYPE "EWC" EVAPORATIVE WATER COOLERS WILL GIVE YOU MAXIMUM HEAT EXCHANGE ON A MINIMUM OF MAKEUP WATER

Liquid to be cooled passes thru finned coils in these compact, efficient units. Cooling is caused by evaporation of fine spray on the coils, under draft. Make-up water requirements are very small. Here is the practical answer to water consumption in cooling liquids — compressor jacket water — lubricating oils — quench oils — Diesel, natural gas and other engine jacket water — all in a closed system that keeps impurities out. "Q" Factor* features in "EWC" Units include quality "Buffalo" Fans and Pumps, and heavy-duty 3-section cabinet for easy installation and maintenance. Write today for Bulletin 3666A!

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Seal with Steel all the way

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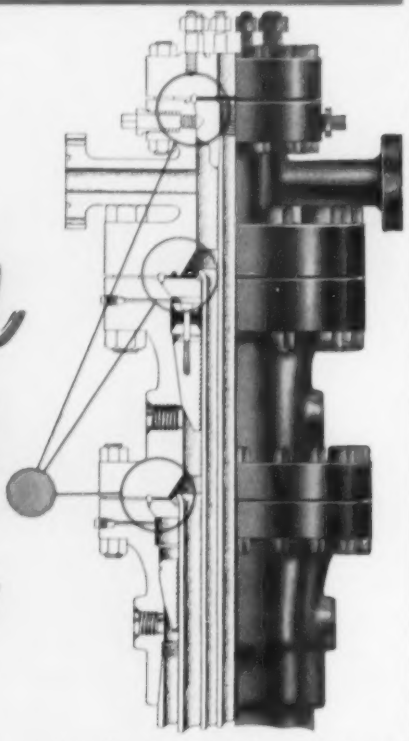
- for Simplicity



Assembly of Type "RH" Rectorhead Casing Heads with three Casing Strings and Type "M" Tubing Head. Notice how welding ring seats in head body. API Ring Gasket completes the "seal-with-steel."

You wouldn't think of using soft packings between flanges or flanged fittings, particularly where temperatures and pressures are high. Then why use them in casing or tubing heads, where conditions are even more severe, and leaks more disastrous.

When you use Rectorheads you "seal-with-steel." The welded seals, plus API Ring Gasket, never require replacement or maintenance, will not "flow" under high pressure or temperature, will not "freeze" or contract under low temperature, will not burn out or deteriorate. The Rector Welding Procedure is covered in API Std. 6E., Third Edition, January 1952.

Why risk soft seals in your well heads when you don't use them in flanges? Specify Rectorheads and you can "seal-with-steel" between casing strings.

Sold through authorized Supply Stores.

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REPRESENTATIVES IN ALL ACTIVE FIELDS

RECTORHEAD RECTORSEAL

should not apply to the 'production and gathering of natural gas'."

Samuel B. Pettengill, member of the Pure Oil Co. legal department and a member of the House of Representatives at the time of passage of the Natural Gas Act, in an address before the Detroit meeting of the Michigan Petroleum Association.

CALENDAR OF EVENTS

MAY

9-10	American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.
9-11	10th Purdue Industrial Waste Conference, Memorial Union, Purdue University.
9-12	American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.
11-13	American Petroleum Institute, Division of Production, Eastern District spring meeting, William Penn Hotel, Pittsburgh.
11-13	Canadian Institute of Mining and Metallurgy, Petroleum and Natural Gas Division, annual technical meeting, MacDonald Hotel, Edmonton, Alta.
12-13	Sixth Symposium, "Automation—Engineering for Tomorrow," School of Engineering, Michigan State College, East Lansing, Mich.
12-19	Sixth Latin American Congress of Chemistry, Caracas, Venezuela.
14-22	World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt, Germany.
16-18	American Petroleum Institute, Division of Transportation, products pipeline confrence, Edgewater Beach Hotel, Chicago.
16-18	Southern Gas Association, New Orleans.
19-20	Society of Exploration Geophysicists, 10th annual Gulf Coast meeting, Plaza Hotel, San Antonio.
20-22	Appalachian Geological Society, Virginia Geological Survey, and West Virginia Geological Survey, spring field conference, Kavannaugh Hotel, Harrisonburg, Va.
23-25	American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.
26-27	Western Petroleum Refiners Association, technical-industrial relations meeting, Settles Hotel, Big Spring, Tex.
26-27	American Institute of Mining and Metallurgical Engineers, Rocky Mountain Petroleum Sessions, Shirley-Savoy Hotel, Denver.
26-27	Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.
30-June 1	Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

1-3	Tenth annual Short Course on Gas Technology, Texas College of Arts and Industries, Kingsville, Tex.
5-9	Canadian Gas Association, annual

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meeting, Sheraton-Broeck Hotel, Niagara Falls, Ont.

6-9 Oil and Gas Power Division, American Society of Mechanical Engineers, 27th annual conference and engineering exhibit, Hotel Statler, Washington, D. C.

6-10 American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.

6-15 Fourth World Petroleum Congress, Rome, Italy.

7-9 National Oil Scouts and Landmen's Association, 32nd annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.

9-10 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

11-15 Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

12-17 Society of Automotive Engineers, golden anniversary summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

16-18 Interstate Oil Compact Commission, Cosmopolitan Hotel, Denver.

17 Northern California Section, American Institute of Chemical Engineers, symposium on waste disposal, University of California, Berkeley, Calif.

20-23 American Society of Mechanical Engineers, semiannual meeting, Statler Hotel, Boston.

23-24 Western Petroleum Refiners Association, technical-industrial relations meeting, Broadview Hotel, Wichita, Kans.

23-26 Rocky Mountain Oil Show, Casper, Wyo.

26-July 1 American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

JULY

20-22 Instituto Tecnologico y de Estudios Superiores de Monterrey, first annual short course on instrumentation for industry, campus, Monterrey, N. L., Mexico.

AUGUST

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting, Hotel Multnomah, Portland, Ore.

29-31 15th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

SEPTEMBER

11-13 Independent Natural Gas Association of America, annual meeting, Jasper Park Lodge, Jasper Park, Jasper, Alberta, Canada.

12-14 American Institute of Electrical Engineers, electrical conference of the petroleum industry, Shamrock Hotel, Houston.

13-24 First International Instrument Congress and Exposition, and ninth National Instrument Conference and Exhibit, Philadelphia.

14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana - Arkansas Division, Mid-Continent Oil and Gas Association, annual membership meeting, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

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The facts are . . .
Series "80"
TUBING BLOCKS
add up to . . .

★ More weight, greater capacity—free, true falls. J-M "Klipper" Grease Seals on all Sheave bearings.

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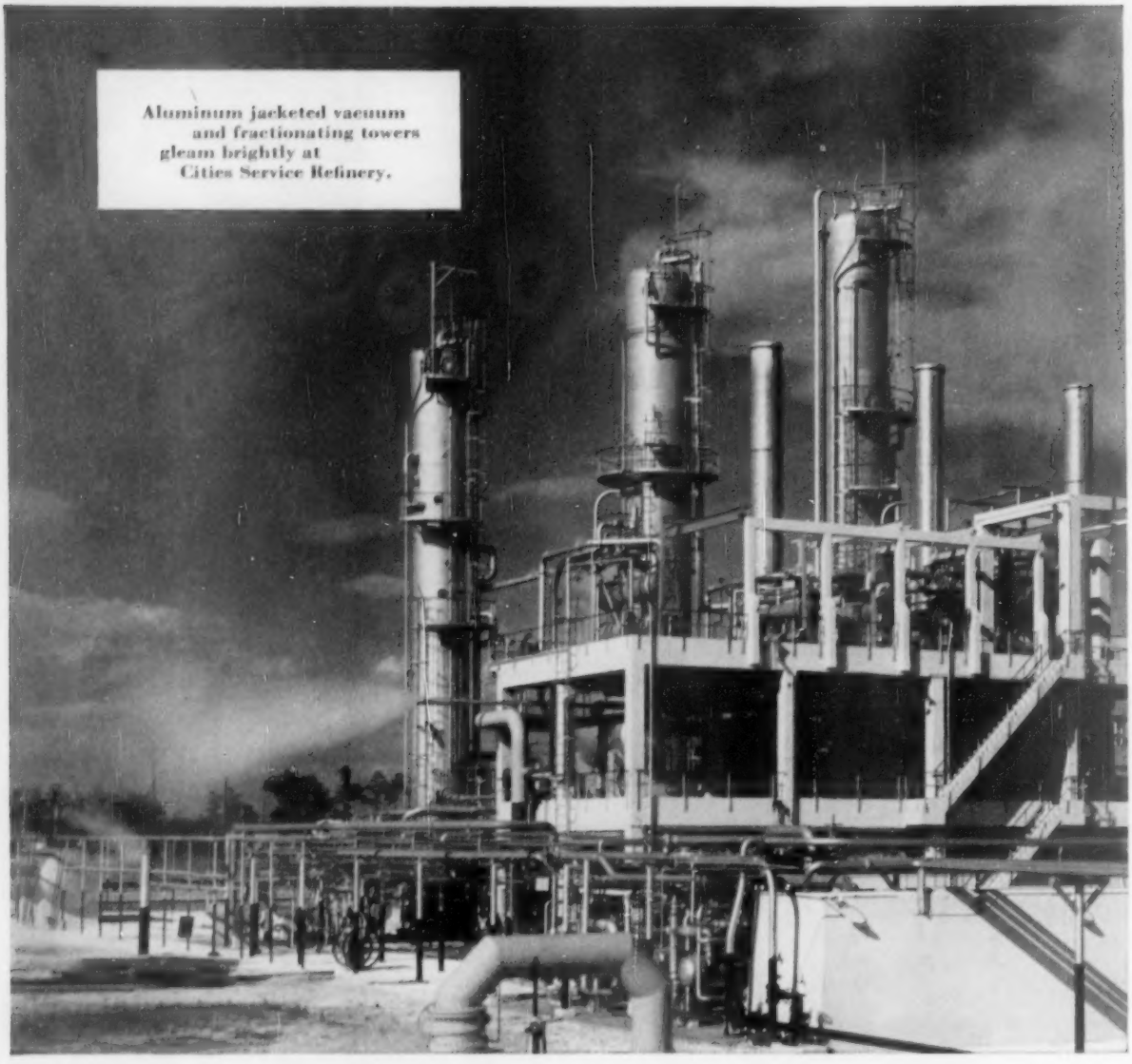
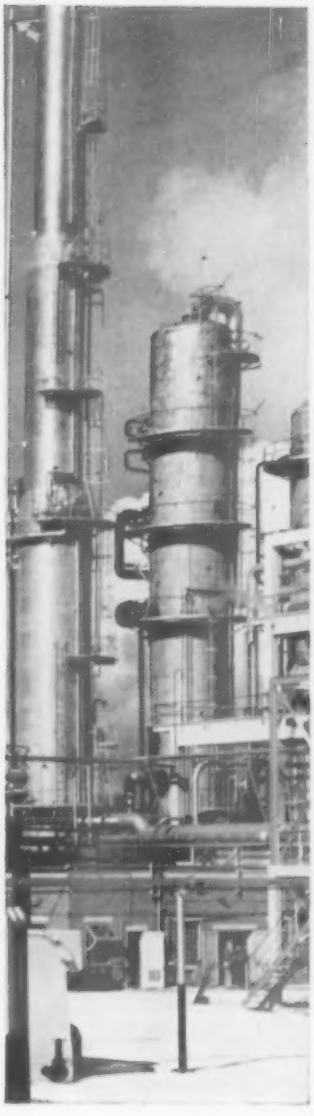


Aluminum jacketing provides maintenance-free beauty in Cities Service Lake Charles Refinery

Selected because of its freedom from maintenance and lasting good looks, shining rust-proof Reynolds Aluminum is used throughout the Cities Service Lake Charles Refinery, often called the most beautiful in the world. Aluminum jacketing used on heat exchangers, high pressure steam lines, vacuum towers, hot oil lines, fractionating towers, feed tanks and pumps provides freedom from maintenance, efficient insulation in addition to easy original application.

Light weight and non-sparking qualities make aluminum ideal for walk-ways and tank decks. Its high heat transfer and resistance to corrosion lend themselves to a wide variety of process applications. For more information on aluminum in the process industries, call the Reynolds office listed under "Aluminum" in your classified telephone directory. Or write to *Reynolds Metals Company, 2595 South Third Street, Louisville 1, Kentucky.*

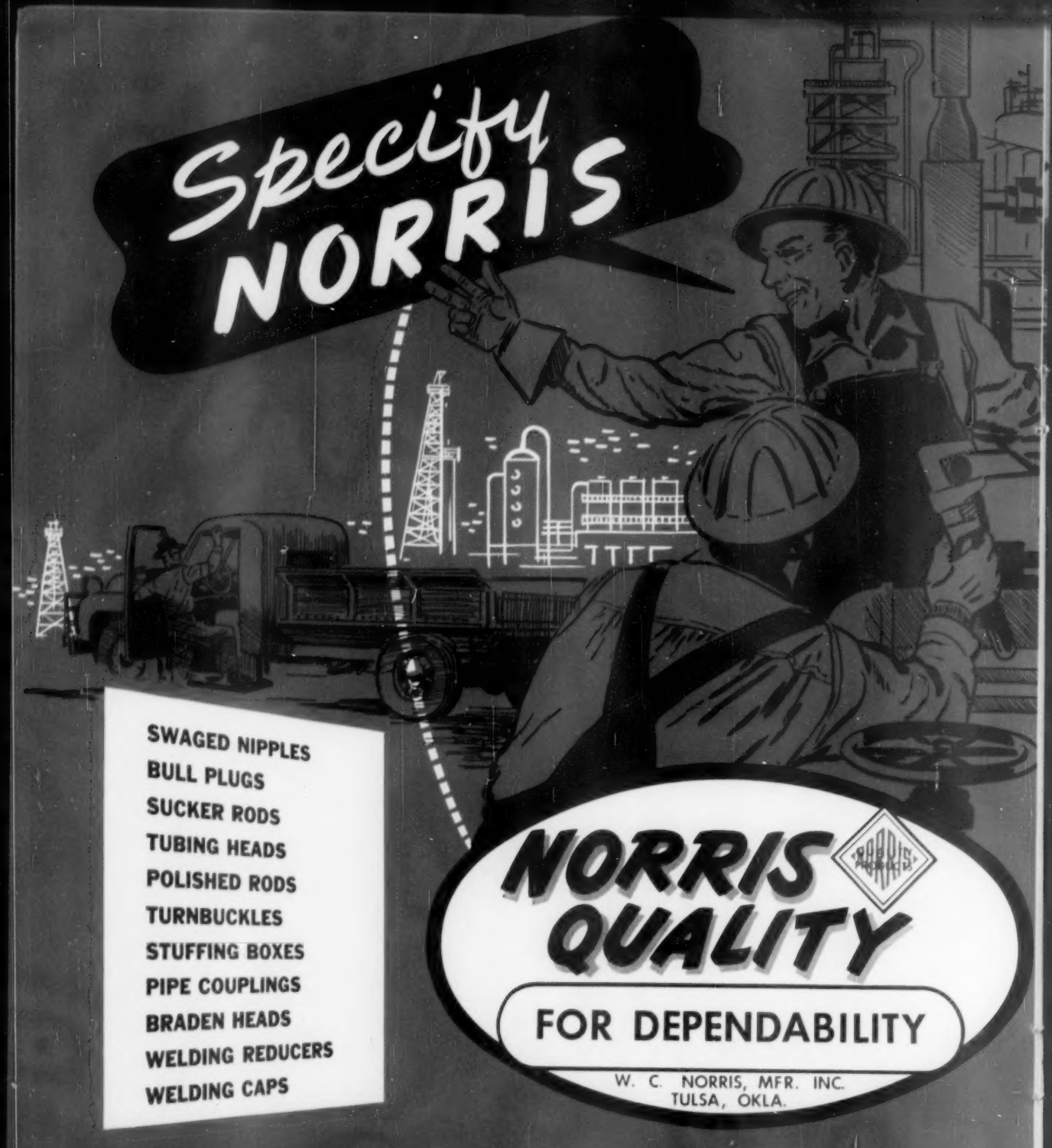


Efficient insulation and freedom from maintenance make aluminum jacketing ideal for tanks, lines, towers and heat exchangers.

Aluminum's fine appearance goes hand in hand with its practical value on these spherical storage tanks.

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND



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the OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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JOURNALLY SPEAKING . . .

Beating the Overhead

IF you're going to go into the oil business, go into it in a big way. High overhead will eat up the little fellows.

At least that's the experience of a reader in New Jersey who is about as small a participant in the oil industry as it's possible to be. He has a problem—but he also offers a solution.

Some years ago this man paid $2,000 for a piece of oil royalty. His oil payments aren't as big as they used to be, but his real trouble is that the well also produces a little gas. This is bad. It costs him money. Every month he receives a "gas purchase account" check for 1 cent or 2 cents, or sometimes even 3 cents.

What can you do with a 1-cent check? He writes:

"My problem at one time was: How shall I cash these checks? My bank makes a charge for cashing checks, and the charge would be greater than the value of the check.

"Moran and Mack, the famous blackface vaudevillians, once came forth with this dialog:

"'On our farm we bought hogs for $4 and sold them for $3.'

"'You can't make any money that way.'

"'We found that out.'

"So, not caring to lose money by cashing these checks, I went to my bank and asked how to do it. They told me to save the checks and send them in every once and a while to the oil producer. Thus far I have sent in one bundle for which I received a little over $8. Now I have 85 checks, worth less than $2, so I shall wait a few more years before sending in another bundle.

"One thing that has always interested me is the cost of sending one of these checks to me. The postage alone is 3 cents for mailing each check. The office cost of producing the check and having it entered in the books is doubtless more than 3 cents each.

"Why not send me one check per year and give me that 3 cents postage and the cost of producing the 11 tiny checks? I might average 10 cents per month in that way and receive $1.20 at the end of the year. As things are now I receive about 24 cents a year."

Now there's a constructive idea. If universally adopted it might save the oil companies and the royalty owners a collective tidy sum. There's just one thing wrong with it. He proposes that the savings made by the oil companies be passed on to the royalty owners. That might be a bit on the subversive side.

Another thing bothers us, too. How would this saving be entered on the books? The C.P.A.'s and income-tax men might raise an eyebrow at an entry reading something like: "Payment for not sending you your money when it was due."

Up and Atom Tax Bill

YOU have to hand it to the Texas Legislature for being right on the job when it comes to finding new sources of revenue.

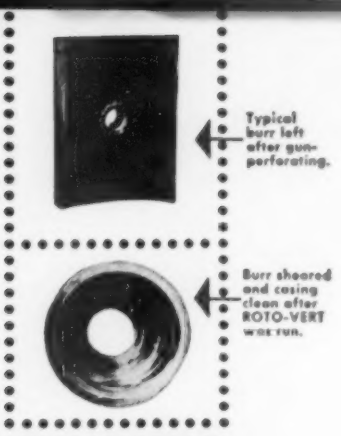
A couple of weeks ago Austin was all agog with a story that a rich bed of uranium ore had been found on a ranch in Southwest Texas. Samples of the yellow rock were being gingerly passed from hand to hand, and hardware stores were doing a brisk business in Geiger counters.

Within a few days the legislature brought out an omnibus tax bill including a tax of 5 per cent on the value of any uranium ore produced within the state.

Maybe this was just a coincidence, but on the other hand maybe the legislature had read published predictions that by the year 2,000 the uranium atom will be supplying more energy than oil and gas. Since the petroleum industry is now supplying such a large percentage of Texas' tax revenue, the solons understandably wanted to cut the treasury in on anything that threatens to supplant oil.

The oil industry should welcome this development. It's assurance that if the day does come when the atom displaces oil from many of its present uses, this new upstart industry will have to shoulder its share of taxes and perhaps that will make the load lighter on the hard-pressed oil producers.

—*Henry D. Ralph.*



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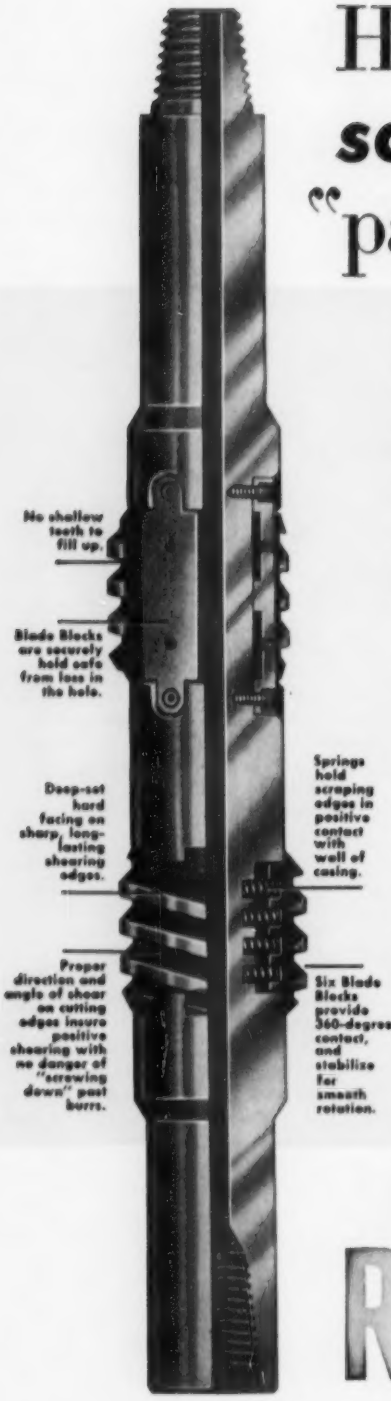
SCRAPING YOUR CASING "pays off"


No shallow teeth to fill up.
Blade Blocks are securely held safe from loss in the hole.
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Unless the inside of your casing—the vital "working surface"—is clean and smooth, there is always a possibility of trouble in future operations. Burrs from gun-shot perforations, hardened cement or mud, and even mill scale are all dangerous when the time comes to run testers or swabs, or to set retainers or packers of any description.

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The ideal time to use the ROTO-VERT Casing Scraper is during the drilling out of cement, at which time it is run as a "follow-up" behind the bit. Thus in a single run you can also remove all hardened cement, mud, burrs and scale which might later damage swabs or testers, and cause packers or retainers to set prematurely—or never set at all.

EASY TO RUN—LOW-COST RENTAL

The Baker ROTO-VERT Casing Scraper is simple to run, and will effectively clean the inside of the casing *when either rotated or reciprocated* (vertical action). No service man is required, and the low rental cost is paid for many times over by freedom from future damage to bailers, swab rubbers and packers, as well as by the elimination of future delays and re-running expense.

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This could solve the imports problem

THE compromise amendment to deal with oil imports, added to the foreign-trade bill by the Senate committee, may prove to be a real solution to the problem or it may turn out to be a meaningless gesture. It all depends on the way it is administered.

But it is definitely a step in the right direction.

By offering relief to any industry threatened with injury from imports, it avoids the stigma of one-commodity legislation. Consumers and the public generally will more readily accept a restriction on oil imports recommended by an administrative agency after an investigation than a special bill lobbied through Congress by producers.

Instead of a permanent, flat percentage quota, it permits selection from a variety of remedies and their flexible application. No one can predict the most desirable relationship between foreign and domestic crude supplies a few years hence.

TRUE, THE LANGUAGE IS VAGUE. Perhaps the amendment leaves too much to the discretion of the President and fails to spell out standards and procedures in sufficient detail. Only experience will tell. For a problem with as many facets as oil imports it is better to experiment with solutions than to lay down a rigid formula at the start.

We now have official recognition by both the legislative and the executive branches that excessive oil imports could injure the domestic producing industry, and that this should not be allowed to happen.

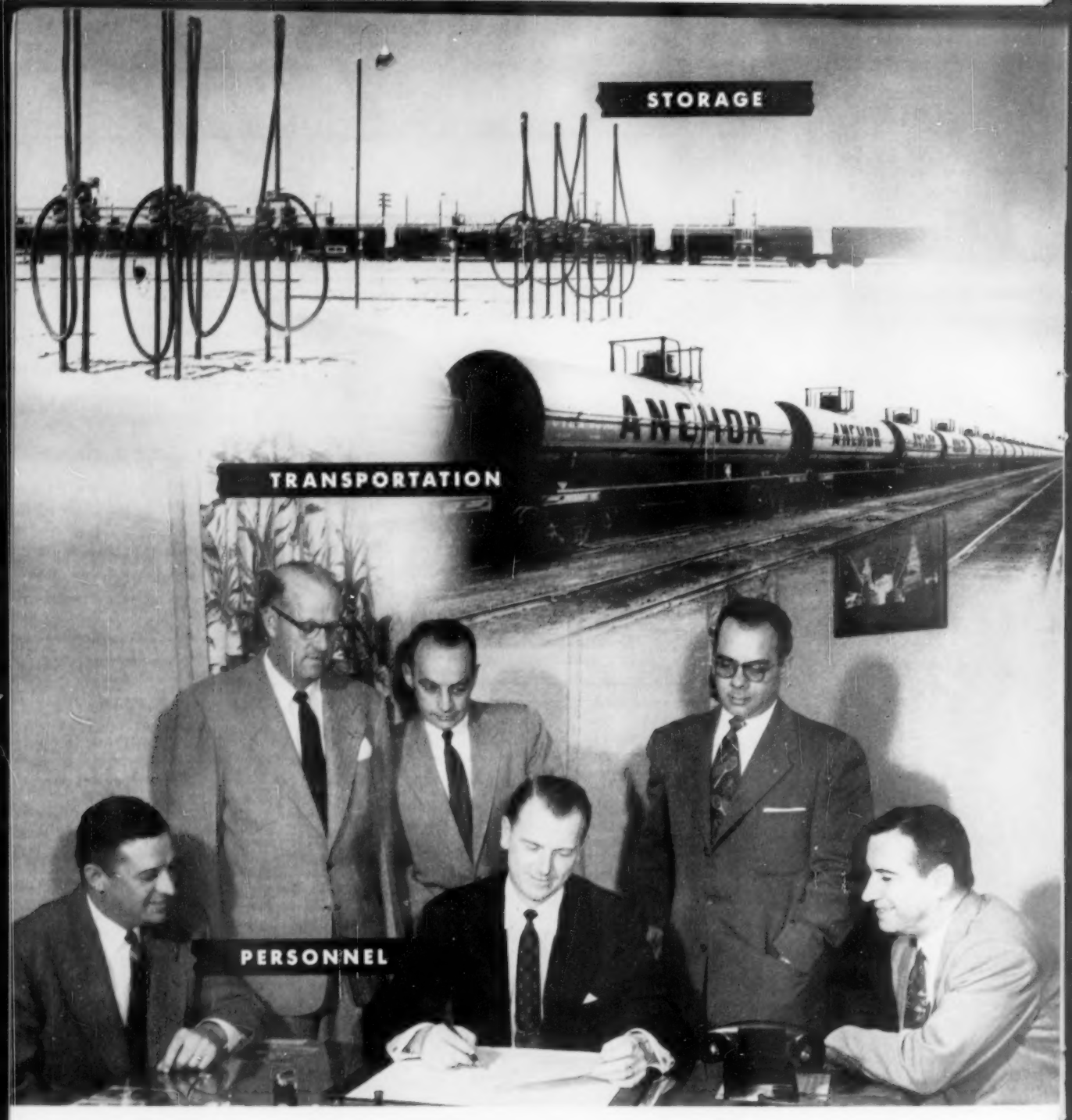
We have a semiofficial standard that for the immediate future oil imports should not substantially exceed the 1954 level.

We have an unofficial promise that the President will "take such steps as he deems necessary to adjust imports to a level that will not threaten to impair the national security."

THAT IS REAL PROGRESS. The test will come in applying these policies. As potential tools the President could make use of tariffs, quotas, treaties with foreign nations, or voluntary agreements with the importers.

Of course, the President could, in the end, conclude that no action is required. Therefore it behooves domestic producers to offer a factual, constructive set of standards by which government agencies can judge such things as the health of the domestic industry, the impact of foreign competition, and the market demand for imported oil.

The battle is far from ended. But the arena has been shifted from the heat of legislative chambers to the presumably calmer and more judicial atmosphere of fact-finding administrative agencies. This method merits a genuine trial before going back to Congress for drastic action.



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THIS WEEK . . . . . IN THE NEWS

International

• Iran's oil will be split nine additional ways in the future. Iricon Agency, Ltd., a new corporation created by nine American oil companies, acquires 5 per cent interest in the Iranian oil consortium. As provided by last year's Iranian oil settlement, each of the five big U. S. companies involved in the Iranian operations surrenders 1 per cent interest to broaden the base of American participation.

• Newest scene of Latin American oil prospecting will be Honduras. A group of Americans has a 20-year mineral concession for exploration on a huge acreage in the northern coastal region and will begin drilling this month. The same group is negotiating for similar rights in nearby Nicaragua.

• Gas soon will start moving through the Sui-Karachi gas line in West Pakistan. The new pipeline is the first long-distance natural-gas carrier in the Far East.

• Exploration is continuing in Israel, despite disappointing results so far. Two deep wildcats recently were abandoned there. Drilling has been suspended at two other tests.

Imports

• Oil men promise to renew their battle for strict controls on foreign crude imports before Congress next year if the President's compromise plan adopted last week doesn't work. Look for the sparks to fly if importing companies fail to follow the cabinet committee's recommendation to restrict imports to 1954 levels . . . and if the President fails to impose promised restrictions should the voluntary controls break down.

Petrochemicals

• Boom conditions are building up in polyethylene, the growing giant of petrochemicals. New plants being built or planned will provide a production capacity far in excess of present demand. But operators optimistically believe new products and new uses for the plastics raw material will take up this slack in a hurry. They envision tough competition during the next 2 or 3 years with more plant expansions ahead as demand grows.

Exploration

• A quiet but steady exploration program is turning South Louisiana into the nation's most promising oil province. Look for it to become even more important. Observers say development is in its early stages with more than one-fifth of the nation's seismic crews still prospecting the area. Prolific sands, high allowables, and exceedingly good success ratios are attracting both large independents and majors.

• Texas has a new oil-producing county. Continental's wildcat in far-southwestern Maverick County flowed 104 bbl. on a 24-hour test through a 3/32-in. choke. Production is from 3,109-4,134 ft.

Offshore

• Operators are hungry for good tracts, but won't gobble up anything in sight. At a Texas leasing sale last week, less than half the offshore acreage was leased. Texaco topped all bidders with a $1-million offer for 640 acres off Galveston County.

• The drive to open more of California's offshore area to exploration seems to be nearing an end. Four bills designed to make more land available are before the state assembly. They have the blessings of legislative committees.

Refining

• Canada's octane race is picking up speed. British American, in a move to keep abreast of the trend toward higher octanes, will add three more catalytic reformers at its Canadian plants. The new units will go up at Clarkson, Moose Jaw, and Edmonton. The company recently added a Catformer at Calgary and is completing one at Montreal.

• Another inland refinery has dropped out of the picture. Magnolia closed its 13,320-bbl. plant at Fort Worth early this month.

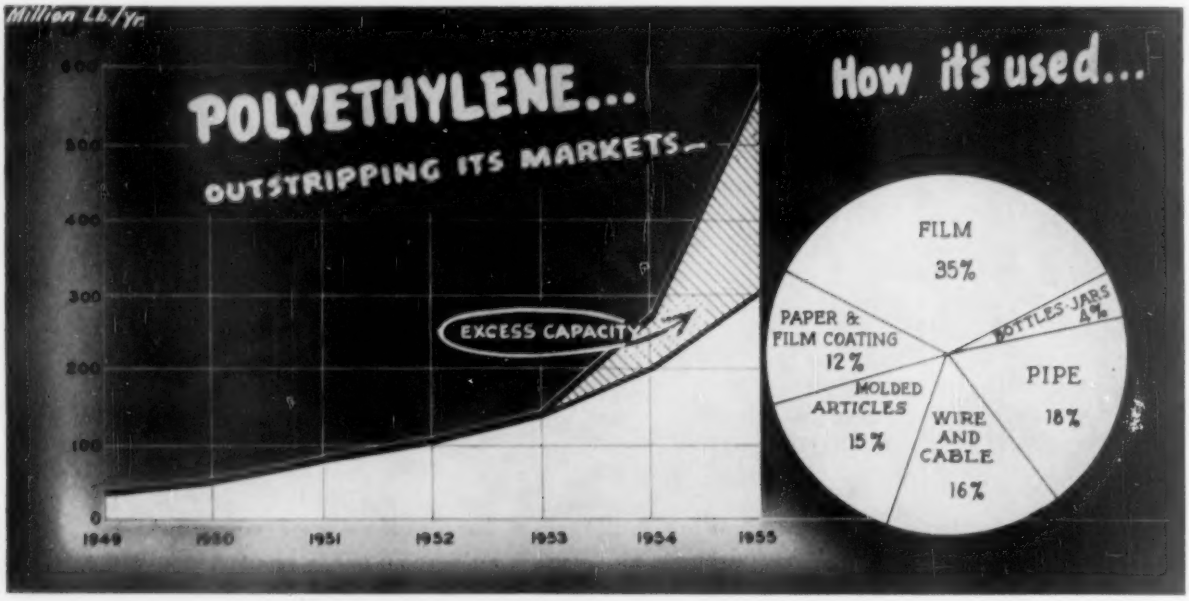
Pipeline

• Diesel, jet, and motor fuels will start moving this month to military bases in Alaska through a new 620-mile pipeline from Haines to Fairbanks.

• Automation is taking another great stride in the pipeline industry. Gulf Interstate Gas Co. received FPC permission to build a robot compressor station near Stanton, Ky. The first of its kind, the station will be controlled from 80 miles away.

Natural Gas

• A tough assignment is being tackled by the House interstate commerce committee. It is rewriting the Harris bill. Its main task is to draft a formula exempting independent natural-gas producers from Federal Power Commission price regulations without taking the lid off prices. Indications are most escalation and favored-nation clauses will be stricken in purchase contracts.



Polyethylene: Ready for a Boom

New plants mean a capacity far in excess of demand, but new products, new uses will take up the slack in a hurry

Tough competition will be the rule during the next 2 or 3 years . . . followed by plant expansion as demand grows

John C. Reidel

POLYETHYLENE—a growing giant in the petrochemical industry — is outstripping its markets.

This petroleum-based raw material for making a wide variety of plastic items of every-day use probably will reach an amazing production rate of a billion pounds a year in this decade.

Until 1954 there wasn't enough polyethylene made to go around. But then supply overtook demand. Surplus capacity in 1955-56 will be a whopping 271,000,000 lb.!

This is not due to a slackening market. Buyers took 200,000,000 lb. of the plastic in 1954, Estimated production for 1955 is 300,000,000 lb. But capacity is increasing faster. Plant investment in the last 3 to 4 years adds up to well over a quarter billion dollars.

This situation would be a danger signal to most people—especially those unfamiliar with the rapid growth of petrochemicals in general or of polyethylene in particular. But the companies which have scrambled aboard the polyethylene bandwagon are optimistic. A few of them have even announced expansion plans for 1957.

Look for 2 or 3 years of intense competition, they say. Existing markets will be expanded rapidly and new uses developed. All the surplus capacity will be taken up in that time. Then there will be more expansion . . . certainly within the next 4 to 5 years. Polyethylene definitely will be the first billion-pound-a-year plastics.

Who's in it? . . . Polyethylene appeared first during the war in military applications such as radar.

In the 5 years ending in 1954 its production jumped fourfold. As late as that year only two companies in the United States—Carbide and Du Pont—shared the production. But court litigation concerning licensing by Imperial Chemical Industries, Ltd., of its exclusive process brought in many competitors.

Now there are 10 companies with 13 plants operating or being built in the United States. This includes Allied Chemical & Dye Corp. which makes low-molecular-weight polyethylene wax, rather than the high-molecular-weight plastic. Newest entrant is Phillips Chemical Co., which just last week announced it would build a polyethylene plant on the Houston ship channel. The plant will use Phillips' new low-pressure catalytic process. It will be linked by pipeline to a 145,000,000-lb. per year ethylene plant to be built at Sweeny, Tex. *(The Oil and Gas Journal, May 2, page 53.)*

First to expand capacity was Carbide at Texas City and Du Pont at Orange, Tex. This was followed within the past year by Texas Eastman at Longview, Tex.; Monsanto Chemical Co. at Texas City; Carbide & Carbon Chemical Co. at Seadrift, Tex.; National Petrochemicals Corp. at Tuscola, Ill.; Spencer Chemical Co. at Orange, Tex.; and now Dow Chemical Co. at Freeport, Tex. Carbide at Torrance, Calif., and Koppers Co. at Port Arthur, Tex., will probably come on stream late this year or early in 1956.

How much? . . . All of these, together with Carbide's South Charleston plant, add up to a U.S. capacity of 571,000,000 lb. per year.

This includes Allied with 20,000,000 lb. per year of polyethylene wax. It does not include Phillips, which has not announced capacity of its Adams Terminal plant.

Looking to the day when demand will be more nearly in line with capacity, Monsanto and National Petrochemicals have announced additional expansion for 1957. It is expected that by 1958 or 1959 the market will take up all the surplus U.S. capacity.

Outside the U.S. there also is activity in polyethylene. Canada has one plant, that of Canadian Industries, Ltd., with a present capacity of 25,000,000 lb. yearly. Montecatini Co. at its Fer-

rara plant in Italy will dedicate this year polyethylene facilities with capacity of 13,200,000 lb. per year.

In Germany, a polyethylene plant of 48,000,000 lb. annual capacity will be built at Gelsenkirchen, on the Rhein-Herne Canal. A new, low-pressure low-cost process will be used. The operating company will be Kohle-Oel Chemie, jointly owned by the oil firm, Deutsche-Erdoel, the chemical firm, Farbwerke Hoechst, and the Ruhr steel combine, Mannesmann. The plant, to cost more than $14,000,000, is scheduled to go into production in the spring of 1957.

What it is . . . Polyethylene is the general name for a range of plastics and waxes obtained by the polymerization of ethylene.

The high-molecular-weight plastic is presently made at high pressures (15,000 to 30,000 psi.) under the I.C.I. license. The process is modified in different ways by each manufacturer to suit his specific requirements. It can be truly called a "petrochemical" since the ethylene feed is ordinarily obtained from refinery gases, natural gas, or from petroleum distillates.

For example, the large ethylene plant of Gulf Oil Corp. at Port Arthur, which supplies Spencer and Koppers, recovers byproduct ethylene from refinery cracked gases. It also separates ethane from these gases for cracking to ethylene. In some operations this is augmented by cracking propane.

National Petrochemical Corp. at Tuscola, Ill., operates on natural gas from Panhandle Eastern pipeline. It processes a maximum of 425,000,000 cu. ft. of gas per day. Ethane is extracted by absorption for cracking to ethylene.

In Europe petroleum distillates are cracked with steam to make ethylene.

Why this optimism? . . . In the face of 271,000,000 lb. of surplus capacity, what is the basis for the polyethylene industry's optimism? The director of research and development of one company states it this way:

. . . Polyethylene is still a "baby" in the plastics field. Much of this optimism is based on the fact it has only recently been subjected to really extensive research and development.

. . . Early license arrangements, now upset, held production within two U.S. companies. Also the materials were in short supply—processors could not get enough to really go to town with it.

. . . Now there is plenty of polyethylene. Competition will be strong between producers and perhaps even more intense between processors. This is already stimulating many new developments which are certain to increase consumption.

Who's Making Polyethylene

Company and location—	Capacity, million lb./yr.	Per cent of total
Allied Chem. & Dye: Tonawanda, N. Y.	*20	3.5
Carbide & Carbon Chem.: Texas City, Tex.	60	10.5
Seadrift, Tex.	60	10.5
So. Charleston, W. Va.	70	12.3
Torrance, Calif.	60	10.5
Dow Chemical: Freeport, Tex.	25	4.4
Du Pont de Nemours: Orange, Tex.	†100	17.5
Koppers Co.: Port Arthur, Tex.	25	4.4
Monsanto Chemical: Texas City, Tex.	60	10.5
National Petrochemicals: Tuscola, Ill.	26	4.5
Phillips Chemical:‡ Pasadena, Tex.		
Spencer Chemical: Orange, Tex.	45	7.9
Texas Eastman: Longview, Tex.	20	3.5
Total (by 1956)	571	100.0

*Low-molecular-weight polyethylene wax. †Estimated. ‡Low-pressure process.

What cost? . . . When asked whether polyethylene prices would drop some more, one producer answered: "High pressure, high capital investment, high maintenance—high cost."

Others, however, do not see it quite that way. They claim that better control of operating variables and reduced maintenance for the present high-pressure process will result in lower prices.

Bakelite (marketing company for Carbide) made several price reductions in 1953, down from 49 cents per pound. There have been hints of possible further reductions. It is said producers are prepared to take another price drop in stride.

Present basic market price ranges from 41 cents per pound for molding grade up to 50 cents for colored polyethylene. Film grade is priced at around 43 cents, but electrical grade is 46 cents and higher.

On a volume basis polyethylene at 41 cents is cheaper than any other plastic except polystyrene. Polyethlene has a low specific gravity of 0.92, and at 34 cents it would be competitive with polystyrene on a per volume basis.

Largest question mark in the polyethylene picture is effect of the low-pressure processes announced by Phillips and being developed by others. Phillips has not said how its low-pressure process will affect polyethylene prices. However, it does anticipate a lower capital investment.

What are its uses? . . . Polyethylene chemically is similar to paraffin wax.

But the high-molecular-weight plastic has strength and flexibility. These properties plus chemical inertness, good electrical characteristics, low moisture permeability and other desirable attributes, make it one of the leading plastics. It can be cold drawn (extruded) to a transparent film.

Most persons know polyethylene as the "squeeze bottle" plastic. But bottles and jars are a minor part of its use.

Biggest use is as a packaging film, particularly for vegetables. To understand why it has caught on so rapidly in this field try the "living fish" trick. Put the fish inside a polyethylene bag full of water. The water will not leak but the fish will continue to breathe.

Polyethylene "is a good moisture barrier preventing dehydration, yet is permeable to oxygen and carbon dioxide, allowing vegetables, for instance, to keep breathing and thus delay decay."

Packaging film used up some 45,000,000 lb. of polyethylene in 1953 and (conservatively) around 70,000,000 lb. in 1954. There will certainly be over 100,000,000 lb. used for this purpose in 1955. One estimate goes as high as 160,000,000. Experts say that by 1960 film alone may take as much as 300,000,000 lb. of polyethylene.

What are the future trends? . . . There will be a lot of work done toward improving polyethylene rigidity, resistance to stress cracking, and to softening under heat. The high-pressure process will be improved or modified to make a number of polymers, each for a given application, rather than a general-purpose material.

Phillips claims its Marlex 50, product of the low-pressure process, has a tensile strength of 3,700 psi. compared to 1,800 psi. for polyethylene now on the market. Softening point is said to be 30° F. higher. This means that polyethylene containers could be sterilized; more important, it could open up a market for hot-water pipe.

Another low-pressure process has been developed by Karl Ziegler in Germany. Six U.S. companies are reported to have research licenses for this process.

A very interesting development is the use of gamma rays to increase heat resistance of polyethylene. But right now this is a costly method limited to specialty products. General Electric Co. uses this method together with an antioxidant to make an electrical insulating tape that will not melt at 300° F.

Iranian Issue Finally Settled

Nine U. S. companies form new agency to take 5 per cent share in consortium

Dahl M. Duff

NEW YORK.—A new group of American companies has taken a small but significant interest in Middle East oil.

A 5 per cent share in the Iranian operation was transferred April 28 in New York to a group of nine United States companies.

Iricon Agency, Ltd., a new Delaware corporation, took over the interest on behalf of the participating companies.

The 5 per cent is held by the following:

... **Atlantic Refining Co.,** Philadelphia.

... **Hancock Oil Co.,** Long Beach.

... **Pacific Western Oil Corp.,** Los Angeles.

... **Richfield Oil Corp.,** Los Angeles.

... **San Jacinto Petroleum Co.,** Houston.

... **Signal Oil & Gas Co.,** Los Angeles.

... **American Independent Oil Co.,** San Francisco.

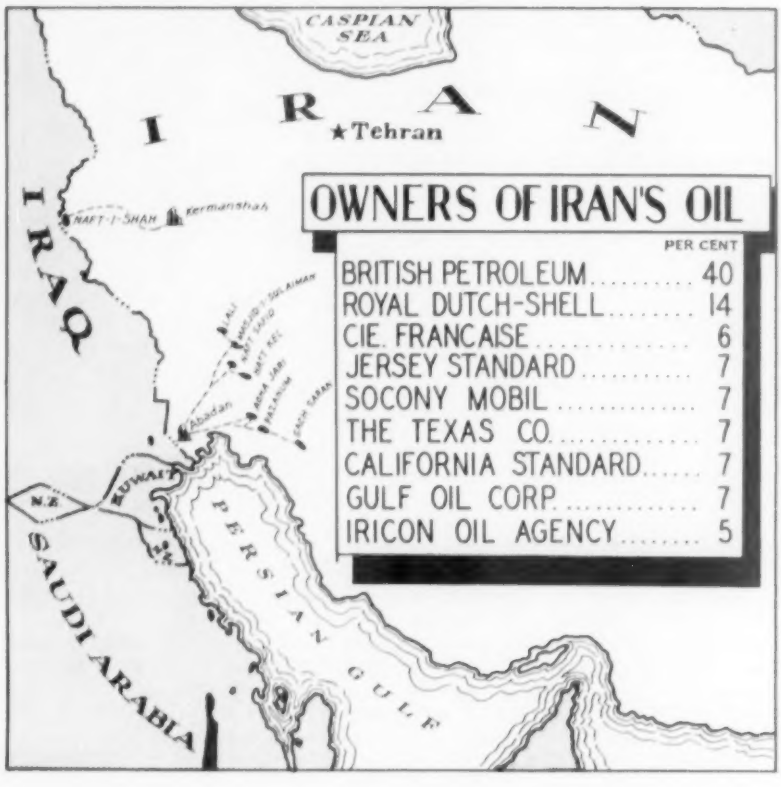
... **Standard Oil Co.** (Ohio), Cleveland.

... **Tide Water Associated Oil Co.,** San Francisco.

The interests in Iricon are broken down into twelfths. Richfield holds the largest part, three-twelfths or one-fourth. American Independent, or Aminoil, holds two-twelfths, or one-sixth. The remaining seven have one-twelfth each.

To figure what this means in terms of the interest in the entire Iranian consortium, the twelfths are in each case multiplied by five, the percentage represented by Iricon. Thus, for Richfield, three-twelfths times five means 1¼ per cent. For Aminoil, it is ten-twelfths or five-sixths of 1 per cent. Each of the others has five-twelfths of 1 per cent.

The prize . . . Though some of these individual shares seem minute, the prize is big. Iran is rapidly moving back to its position as one of the top producing countries of the Middle East. Output is slated to average 600,000 bbl. daily in 1957, and reserves have been unofficially estimated at upwards of 27 billion barrels.



The interest taken by these nine companies in Iran broadens the base of American participation in Middle East oil. Though the percentages are relatively small, the list of companies having some Middle East production has been lengthened considerably. Including the 10 owners of Aminoil, there are now 22 American operators sharing to some degree in Middle East oil.

Until 1948, American participation in the Middle East was entirely through the large holdings of the five international companies — Standard Oil Co. (N. J.), Standard Oil Co. of California, Gulf Oil Corp., The Texas Co., and Socony-Vacuum Oil Co., Inc., (now Socony Mobil Oil Co., Inc.).

In that year, Aminoil obtained the concession in the Neutral Zone from the shaikh of Kuwait, and Pacific Western got a similar concession over the other undivided half from Saudi Arabia. Production, discovered in 1953, now totals about 30,000 bbl. daily. Aminoil is owned by Phillips Petroleum Co.; Lario Oil & Gas Co.; Ashland Oil & Refining Co.; Ralph K. Davies, Aminoil president; J. S. Abercrombie, Houston; Deep Rock Oil Corp.; Sunray Oil Corp.; and Globe Oil & Refining Co.; as well as Hancock and Signal. The latter two are among the new participants in Iran.

New lineup . . . In the year-long negotiations leading to the formation of the Iranian consortium and the final settlement of the nationalization dispute on October 29 last year, it was generally agreed that an interest by smaller United States companies would be desirable.

To accomplish this, each of the five major American participants — Jersey Standard, Socony, Gulf, Texas, and Standard of California—agreed to surrender 1 per cent interest in the consortium within 6 months. As a result, their interest was reduced from 8 to 7 per cent each, and 5 per cent interest was offered to a new company to be formed by responsible and qualified U. S. firms.

The organization of Iricon agency and its acquisition of the available 5

per cent thus makes the interests in the Iranian operation as follows:

. . . **British Petroleum Co., Ltd.,** 40 per cent.

. . . **Royal Dutch-Shell,** 14 per cent.

. . . **Five U. S. companies** each holding 7 per cent for a total of 35 per cent.

. . . **Cie. Francaise Des Petroles,** 6 per cent.

. . . **Iricon Agency,** 5 per cent.

The shares of the European participants were unaffected by the transfer to Iricon.

United States companies interested in taking a part of the 5 per cent made their bids through the State Department early this year. The proposals were checked by Price Waterhouse & Co., which certified each approved applicant for varying parts of the entire amount available.

Originally 12 companies were certified, comprising not only the nine final participants but also Cities Service Co., Sinclair Oil Corp., and Anderson-Prichard Oil Corp. Before final transfer of the 5 per cent, Sinclair and Cities Service transferred their interests to Richfield, and Anderson-Prichard bowed out in favor of Aminoil.

The State Department left it to the companies to work out their own organization to receive the 5 per cent. Some of them pressed for an arrangement whereby the individual shares would be weighted according to the percentages for which they had been certified. However, the final agreement provided that the split be made equally among the approved 12 companies. The transfers account for the different percentage interests.

Big task . . . The transfer of the 5 per cent, the various assignments of interest, and the accompanying legal technicalities turned out to be a monumental task. It involved around 4,000 signatures and 2,000 company seals on the mass of documents, applying to the larger shareholders as well as the new independent participants. None of the interests can be transferred for 5 years.

Each of the independent participants has established its own individual trading company in Iran to receive and dispose of its share of the production. The same procedure is followed by the larger shareholders. The trading companies provide funds for the Iranian operating companies, sell oil at their own posted f.o.b. Iranian price, and are subject to a 50 per cent Iranian income tax. Iricon itself does not engage in any marketing or transportation activities.

Organization . . . President of Iricon is R. S. Stewart, vice president and assistant to the president of Standard Oil Co. (Ohio). Vice presidents are Benno Schmidt, San Jacinto Petroleum (also treasurer); Garth Young, Signal; and David Hecht, representing the J. Paul Getty interests which control Pacific Western and Tide Water. Secretary is Carl F. Farbach, New York, attorney for the organization.

Iricon has representatives on the boards of the principal Iranian consortium holding company, Iranian Oil Participants, Ltd., and the affiliated service company, Iranian Oil Services, Ltd. For the time being, Stewart will hold these positions, but it is expected that they will be turned over later to a full-time general manager, who probably will be named in a few weeks.

Iricon will establish small offices in London and New York to handle scheduling, accounting, servicing, and other management functions. Stewart emphasized that the company will leave marketing and transportation of the oil to the individual participants.

Finances . . . Under the Iranian settlement, British Petroleum took a 40 per cent interest in the consortium and is to receive $600,000,000 for the remaining 60 per cent as distributed to the other partners.

This means that each 1 per cent interest in the Iranian operation requires $10,000,000. However, of this, 85 per cent is in the form of a long-term oil payment of 10 cents a barrel on exports.

There also are certain other expenses borne by the participants. The Iranian settlement was described at the time as the largest business deal ever negotiated.

Plans . . . Iranian production during the current year is expected to average about 340,000 bbl. daily with the consortium taking slightly more than 300,000 bbl. daily. The remainder goes to the National Iranian Oil Co. for its own commitments, including domestic consumption.

Thus, the 5 per cent represented by Iricon will mean about 15,000 bbl. daily this year, rising to 30,000 bbl. daily (5 per cent of 600,000 bbl. daily) by 1957.

Roughly half of this is in products from the Abadan refinery. What disposition the independents will make of these is not known. The large international companies interested in the consortium have their own marketing outlets and distribution arrangements abroad.

Some of the crude production of the independents presumably will be imported into the United States. Products will be more of a problem since they are in small quantities and a market is not readily available.

Discussing the negotiations that led up to the transfer of the 5 per cent a day ahead of the April 29 deadline, Stewart said full credit should be given to all the companies involved, as well as to the U. S. State Department. He said there was cooperation and good will on all sides in working out an extremely difficult and complicated arrangement within a relatively short time limit.

He said that the new participants intended to be as constructive as they know how in the future functioning of the Iranian operation. Such an approach, he said, is necessary for making the agreement work to the mutual benefit of Iran and the United States.

Industry Briefs

DENVER.—Colorado Interstate Gas Co. has awarded a contract to Houston Contracting Co. to build a 126-mile natural-gas line this spring. The 22-in. line will run from southeast of Laramie, Wyo., to Denver.

HOUSTON.—"Mr. Gus" is on the move again after its first offshore wildcat for Shell Oil Co. was abandoned as a dry hole 5 miles off San Luis Pass between Galveston and Freeport. The C. G. Glasscock drilling barge will drill another test for Shell 20 miles east of Corpus Christi and 1¾ miles off Mustang Island in 38 ft. of water.

COLORADO CITY, Tex.—A new safety record of 10,000 days without a disabling injury has been set at the Hendrick station of Shell Pipe Line Corp. in Winkler County, Texas. The record dates back to December 9, 1927, when the station opened and represents 27 years and .138 days without a lost-time accident. It is a record for any Shell Pipe Line facility.

NEW YORK.—Socony-Vacuum Oil Co., Inc., has changed its name to Socony Mobil Oil Co., Inc., to link the corporate name more closely with the Mobil brand products the firm sells. The old name was adopted after the merger in 1931 of Standard Oil Co. of New York (Socony) and the Vacuum Oil Co.

AUSTIN.—E. O. Thompson, senior member of the Texas Railroad Commission, has been named an official representative of the United States on the committee of honor for the Fourth World Petroleum Congress in Rome June 6-15. The other representatives are Interior Secretary Douglas McKay and Ambassador to Italy Clare Boothe Luce.

HOUSTON.—Gulf Coast Leaseholds, Inc., recently bought an interest in 16 producing wells in Southeast Texas from William S. Thomson, Houston oil operator.

Gas Lines Started

System will provide outlet for five Colorado fields

FORT MORGAN, Colo. — Natural Gas Producers, Inc., wholly-owned subsidiary of Colorado Interstate Gas Co., has started construction of 62 miles of natural-gas pipeline in northeastern Colorado.

The facilities will gather and transport natural gas from the Adena, Fort Morgan, Little Beaver, Badger Creek, and Bobcat fields, all in the Denver-Julesburg basin.

Under construction is 49 miles of 10-in. line from the fields to Colorado Interstate's 20-in. main transmission line from the Hugoton, Kan., field to Denver. The firm also is building 13 miles of distribution lines.

Cost of the project is estimated at $1,374,000. Completion is expected late in June.

Natural Gas Producers will buy the gas at two gasoline plants, one already in operation near the Adena field and another nearing completion near the Little Beaver field.

New Cracking Catalysts

NEW YORK. — Two new cracking catalysts have been announced by Davison Chemical Co. Division of W. R. Grace & Co. One boosts alumina content from the conventional 13 to 25 per cent. The other is a low density catalyst. Both have been thoroughly field-tested, said Davison.

Each will find use for specific operating conditions. The high-alumina product shows better maintenance of activity and surface area, narrow particle size distribution, and lower stack losses, according to the company. The low-density catalyst shows greater stability without sacrificing attrition resistance.

Texas Gas Lets Contracts

OWENSBORO, Ky. — Texas Gas Transmission Corp. has awarded the bulk of its summer expansion program to H. C. Price Co., of Bartlesville, Okla. Houston Contracting Co. was awarded a 13-mile section of 20-in.

Price will lay 77 miles of 26-in. main line No. 2 loops from Covington, Tenn., to Jefferson, Ky. The firm must complete this work by September 30.

The company also has 74 miles of 12-in. from Hardinsburg, Ky., to Bedford Junction, Ind.; 35 miles of 10-in. from Bedford Junction to Columbus, Ind.; and 5 miles of 8-in. from Bedford Junction to Bedford, Ind. These projects must be completed by October 31.

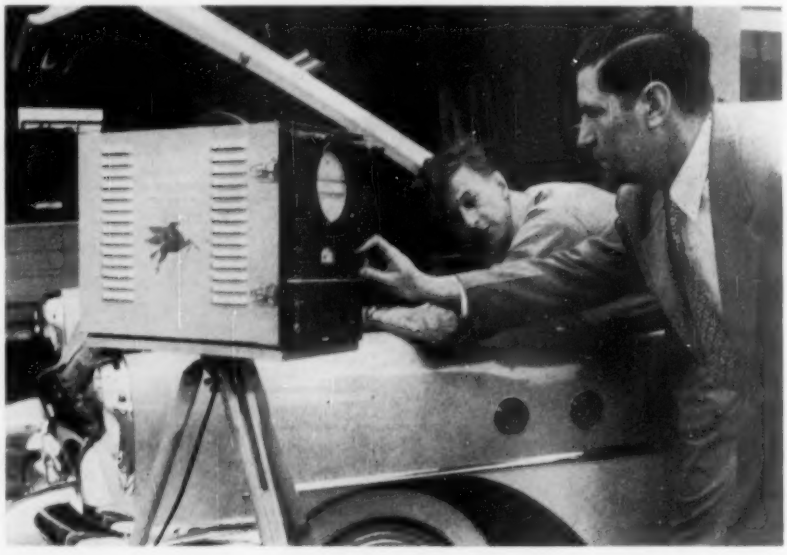
Pentzein, Inc., Omaha, will build the river crossings, which consist of single 26-in. lines across the Tennessee and Cumberland rivers near Calvert City, Ky.

Tax Protest Period Set

DENVER. — Oil firms questioning the legality of Colorado's severance tax on oil and natural-gas production have until January 15, 1956, to file lawsuits to recover payments made under protest.

A new law sets a 3-months' statute of limitations for filing suits challenging the state revenue director's decision the tax is legal. The limitation starts running October 15. If the firms fail to file a suit within 3 months, oil and gas tax payments made can be retained by the state.

Oil companies have contended the levy is actually a gross income tax on production and is unconstitutional.



Electronics Spots Motor "Bugs"

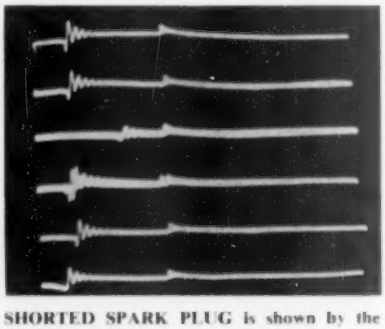
NEW YORK.—An electronic engine analyzer used for some time in research laboratories now will serve the motoring public at the garage level.

Developed in the Socony Mobil Laboratories, this device will be made and sold by the Allen B. Du Mont Laboratories, Inc.

The 60-lb. instrument looks like a portable television set. When connected to an automobile ignition system by two simple lead wires, it projects a "picture" of each cylinder's operation via a cathode-ray tube to an oscilloscope screen.

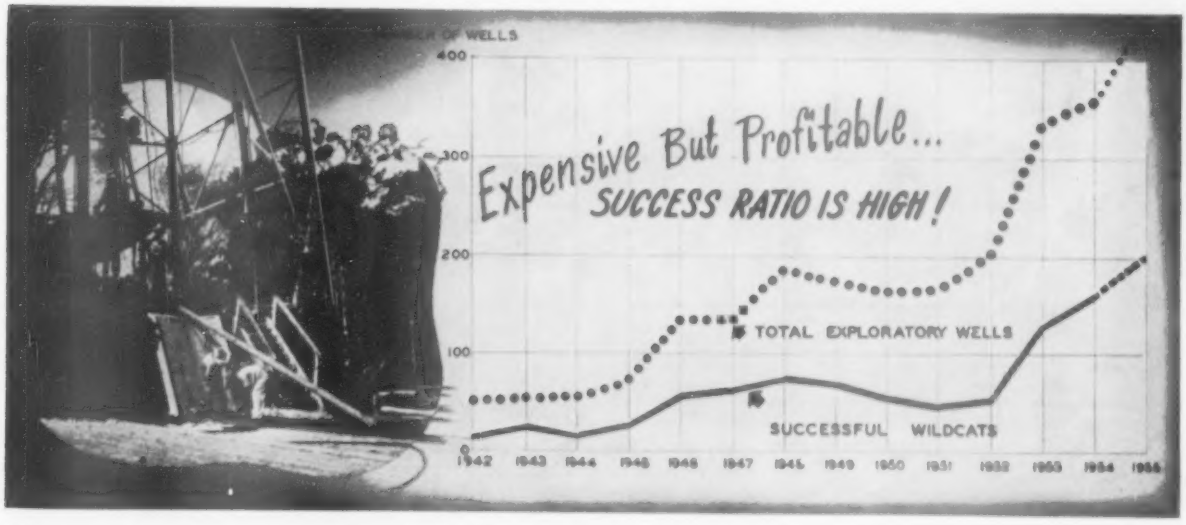
According to Socony Mobil, the analyzer will detect nearly all ignition system trouble including spark-plug fouling and misfiring, broken plugs that short-circuit, defective wiring and switches, worn distributor cam and shaft bearings, defective coils or condensers, burned distributor points, and last but not least, preignition and common knock.

It will be useful in checking ignition timing and intake and exhaust valve operation. Altogether, picture patterns showing about 65 different engine ailments have been observed and identified by Socony Mobil engineers.



SHORTED SPARK PLUG is shown by the third line from top screen of new electronic engine analyzer developed by Socony Mobil research. Each line represents one cylinder in an automobile engine.

The instrument can be powered by a car battery or 110-volt source. It can be set on the floor of a car for engine testing on the road. This is expected to be one of its most useful purposes, since it will be able to find preignition and knock problems which do not always show up in the shop.



Future looks good in South Louisiana . . .

. . . Nation's Most Promising Area

Norman S. Morrisey

NEW ORLEANS.—South Louisiana is quietly stealing the exploration spotlight.

This oil province, already the nation's No. 1 exploratory area, promises to become even more important in the next few years.

There are several factors which point to a continued high rate of activity:

. . . Nearly 100 seismic crews—one-fifth of the nation's total—are combing the swamps and marshes for prospects to be drilled.

. . . The area still is in the structural phase of exploration. Stratigraphic traps, where some experts expect half of any area's oil to be found, are yet to be sought actively.

. . . Prolific sands and high allowables more than offset the high drilling and exploration costs.

. . . Large independent companies, prohibited by high costs from entering the play earlier, are eying the area and are expected gradually to move in, further increasing the amount of exploratory activity.

. . . The success ratio is high. Out of 102 exploratory wells of all kinds drilled during the first 3 months this year, exactly half were successful. This 50 per cent success record compares with a 1954 national average of 17.8 per cent.

The aggressive search for oil is nothing new for South Louisiana. Intensive geophysical work has been carried on for the past 25 years. But better equipment and advanced interpretation are constantly finding new fields.

Reserves . . . South Louisiana is generally credited with known reserves of 2.5 billion barrels.

Many geologists expect strat traps yet to be found to provide an equal amount, giving the area a conservative claim to 5 billion barrels of recoverable reserves.

Prolific Miocene sands are the primary objective in South Louisiana. Ultimate recoveries of 50,000 bbl. per acre are not uncommon. A well can easily gross over 2,000,000 bbl. of oil. Most fields have an active water drive which insures a long life and a high recovery.

The Second National Bank of Houston recently made an engineering and production study of South Louisiana fields. It concluded that the Miocene fields contain an adjusted grand total of about 32 million acre-feet of pay. In these porous and permeable sands, engineers figure reserves at between 800 and 1,000 bbl. per acre-foot. But even using a very conservative figure of 250 bbl. per acre-foot, a total production of 8 billion barrels from known fields is indicated. New discoveries could easily double this figure.

Costly but promising . . . Rich reserves and high allowables are attractive to the oil companies in the play, and they tend to offset the high costs of wildcatting and development.

Under favorable conditions, a 10,500-ft. field well can net more than $10,000 a month. This means the well will pay for itself in less than 2 years.

By contrast, Oklahoma operators are faced with payouts of 5 and 6 years on deep wells. The 10,500-ft. Louisiana well has an allowable of 161 bbl. per day (see table) while its counterpart in Oklahoma is held to less than 100 bbl.

Although drilling on the Gulf Coast is hazardous, oil companies are steadily improving their techniques and cutting down on blowouts and fishing jobs. At Weeks Island, for example, Shell Oil Co. has drilled several 17,000-ft. tests in less than 90 days.

Wildcats, however, can be expensive. The discovery well at Amelia cost about $250,000 to get to 13,500 ft. An additional $250,000 was required to deepen it to 14,500 ft. and complete it.

One or two dry tests, however, do not condemn a South Louisiana prospect. A major company drilled 19 dry holes on Cote Blanche, a known salt dome, before hitting on the twentieth. At Avery Island, an oil trap with more than 50,000,000 bbl. of reserves lay between two dry holes less than ½ mile apart.

An active exploration program in South Louisiana can cost $1,000,000 per year for only seismic, leasing, and geological work. Drilling of two or three wildcats can double this figure. One major company recently spent

BARGE DRILLING and canal digging make South Louisiana operations costly.

LOUISIANA'S ALLOWABLES

Depth	Daily inland allowable	Daily offshore allowable
0,000- 2,000	42	138
2,000- 3,000	49	148
3,000- 4,000	59	159
4,000- 5,000	70	169
5,000- 6,000	83	185
6,000- 7,000	97	200
7,000- 8,000	111	221
8,000- 9,000	124	242
9,000-10,000	142	263
10,000-11,000	161	283
11,000-12,000	180	304
12,000-13,000	199	325
13,000-14,000	224	*351
14,000-15,000	251	
15,000-16,000	290	
Below 16,000	345	

*Below 13,000

ACCESS CANALS instead of roads are used to develop a field in swamp country.

more than $7,000,000 in 2 years before spudding a single test.

These high costs have prevented most independents from entering the prolific Miocene trend. They have, however, moved into the Oligocene play on the north where operations are cheaper and drilling problems fewer.

The big attraction is the fact that a 640-acre tract may harbor 30,000,000 bbl. of reserves or even more.

What to expect . . . Operators plan to drill about 450 exploratory tests during 1955, or about 90 more than were drilled in 1954. In the swamp country most of the drilling is from barges, and few barge rigs, if any, are idle.

Offshore drilling is on the upswing, also. There are now 40 rigs running and by January 1, 1956 it is expected there will be more than 100 active locations.

Past successes . . . Exploration in South Louisiana has enjoyed a long and successful record.

Even before the advent of geophysics, companies were finding oil. But geophysics gave the area a tremendous impetus. The early gravity discoveries in the mid-twenties were followed up by successful refraction seismic work. It remained, however, for reflection techniques to uncover the majority of South Louisiana's known reserves.

In the 8-year period from 1933 through 1940, seismic work was largely responsible for finding over 40 per cent of South Louisiana's known reserves. Although the peak year of 1940 for geophysical successes has never been equaled, reflection work, even today, is highly successful.

Seismic work is still being used to good advantage, especially in the swamp areas that in the past have defied the doodle-buggers. A significant development in the past 12 months has been the Reynolds Plotter to aid geophysical interpretation *(The Oil and Gas Journal, December 20, 1954, page 146)*. With this device, it is a fairly simple matter to make geological interpretations directly on the seismic section.

In his recent presidential address to the Society of Exploration Geophysicists, Paul Lyons summed up the area by saying, ". . . South Louisiana, because of terrain and reflection quality difficulties, has been a lingering frontier, belatedly explored."

(A detailed article on the geology of South Louisiana will appear in the May 16 issue of the Journal.)

Texaco Tops Texas Bids

Company offers more than $1,000,000 for 640-acre tract off Galveston County; per-acre offers set new high

AUSTIN.—The Texas School Land Board last week was offered $11,-371,495 for oil and gas leases on 122,-473 acres of school, park, and prison lands.

Roughly $6,000,000 worth of bids were on submerged lands in the Gulf of Mexico within 10 miles of the Texas coast.

The total bids for submerged lands fell far short of the $32,000,000 which the state took in after its first sale of offshore leases in December 1953 following return of the tidelands to the states.

New records . . . Last week's sale, however, did set some new records. The average bid on all tracts was $92.85 an acre and on tidelands tracts, $131.53 an acre. In both cases the average bids were the highest ever received in a state lease sale.

The bidders, though apparently still hungry for good offshore prospects, didn't snap up all land that was offered, less than half in fact. Leases on 346,-000 acres were on the block—186,000 of them submerged lands. Operators bid on 48,000 acres in the gulf.

Topping all bids was The Texas Co.'s $1,079,680 for a 640-acre tract off Galveston County. Next highest was a $1,010,075 bid by Atlantic Refining Co. and Tide Water Associated Oil Co. for 1,440 acres off Matagorda County. Pure Oil Co. apparently just missed on this one with a bid of $1,008,160—less than $2,000 under the Atlantic-Tide Water offer.

There were no other bids of over $1,000,000.

Nearest bid to Texaco's big offer on the Galveston County acreage was only $74,412 by Humble Oil & Refining Co. This tract is near Galveston Island inside the 3-mile line.

Offshore uncertainty . . . It was believed that prolonged uncertainty over whether the federal Government will or will not recognize Texas' claim to lands out to 3 leagues in the gulf may have dampened bidding on tracts more than 3 miles out.

Other reasons suggested are that companies are becoming more aware of tremendous costs of offshore operations, that the unwanted lands just weren't good prospects, and that the state recently increased its minimum requirements on royalty and rentals.

Leases on lands offered at this sale call for one-sixth royalty and $3 an acre annual rental in addition to cash bonus as compared with one-eighth royalty and $2 an acre rental required in past state lease sales.

Humble Plans Gasoline Plant

HOUSTON.—A processing plant handling 11,000,000 cu. ft. of casing-head gas daily will be built in the Neches field about half way between Palestine and Jacksonville, Tex., by Humble Oil & Refining Co.

Fish Engineering Corp. will build the plant. Work is scheduled to start in June. It will be completed in October.

Drilling Firm Sold

HOUSTON. — One of the Gulf Coast's oldest drilling firms changed hands last week when John W. Mecom, Houston independent oil operator, bought the outstanding stock of Cron & Gracey Corp.

Mecom said no changes will be made in operation of the concern. The company will remain in the contract-drilling business and will fulfill all its current contracts and obligations. The assets purchased include four inland water and bay drilling barges capable of drilling in shallow water depths, boats, and service equipment.

Cron & Gracey was organized as a corporation in 1939, but the two principal owners, Lon H. Cron and E. J. (Bear) Gracey, had been partners in a drilling firm long before the incorporation. New officers of the firm will be Mecom, president; Max Prather, drilling superintendent for Mecom, vice president; and R. Hersel Hughes, controller for Mecom, secretary-treasurer.

Platformer Added at Dubach

DUBACH, La.—Contract has been let for building a U.O.P. Platformer at the gasoline plant here owned jointly by Southwest Gas Producing Co., Inc., and the Feazel interests.

Fish Engineering Corp., Houston, will start construction on the unit this month. It is expected to be completed in September.

The Platformer will be integrated with the existing units of the 190,000 M.c.f. daily gasoline plant. It will upgrade the entire gasoline production to premium gasoline of 95 and regular grade of 89 research octane.

The plant has been in operation since 1949. It has 80 miles of gathering lines to several Louisiana fields.

Southwest Gas Producing Co. operates the plant. The Feazel interests are owned by W. C. Feazel, Mrs. Gertrude Feazel Anderson, and G. M. Anderson, Shreveport, and Miss Lallage Feazel, West Monroe, La.

John Hayward Joins Gulf Drilling Fleet

Odeco's newest deep-water portable drilling barge, the John Hayward, is shown successfully undergoing its final equipment test in the South Pass area of the Gulf of Mexico. It now is en route to a wildcat location of Shell Oil Co. in the East Cameron area for its first drilling job. The barge is the second built by Alexander Shipyards, Inc., of New Orleans for Odeco. The first was Mr. Charlie, shown at left background, submerged on location.

Gas Compromise Studied

Harris bill may be rewritten to exempt independent gas producers from FPC control without taking lid off prices

WASHINGTON.—The House interstate commerce committee got down last week to the job of rewriting the Harris bill to protect everybody and hurt no one.

The writing of a formula to exempt independent natural-gas producers from Federal Power Commission price regulations without taking the lid off of prices is going to be a tough assignment. This was evident from the questions committee members threw at witnesses during nearly a month of hearings.

The two most difficult points involved are the handling of escalation and favored-nation clauses in purchase contracts and the proper term to define price

There were several developments in the gas picture during the week:

. . . FPC Chairman Jerome K. Kuykendall told the committee that all members of the commission are agreed that even if producer prices are to be regulated, producers should not be required to get certificates to make sales.

. . . The Senate confirmed the appointment of William R. Connole of Connecticut as a member of the FPC to succeed Nelson Lee Smith. But since Connole will not take office until June 22 this is not expected to affect the commission's stand on the Harris bill. Four members support the bill. The lone dissenter, Commissioner Claude L. Draper, supports the Heselton bill to regulate only the large gas producers.

. . . The interstate commerce committee of the Senate, which was to have started its hearings May 3, put them off for a week so it could study a bill written by Sen. J. W. Fulbright of Arkansas. His bill covers both the Harris bill and the changes suggested by the pipeline companies.

As the committee wound up its hearings, Kuykendall said there are indications that escalation clauses have served their purpose and are now gradually being abandoned. He said producers now feel they know enough about the handling of gas by the pipelines and distributing companies to make deals without such provisions.

Escalation clauses . . . Kuykendall indicated it would be all right with the FPC if the Harris bill was amended to bar all but two classes of escalation clauses, even in existing contracts. The two exceptions are those providing for fixed escalations at stated periods and escalations to meet taxes that may be imposed.

Rep. Oren Harris of Arkansas, author of the bill, takes the position that the acceptance of all outstanding contracts provides a competitive factor for the industry. The control of prices would come when the pipeline companies brought new or renegotiated contracts before the commission.

Kuykendall defended provisions in the bill setting the same standards for the pricing of gas produced by independents and by pipeline companies.

But the FPC chairman warned that price should be defined in terms which could not be misinterpreted. He favored a basis of "just and reasonable" price rather than "fair field price" or "reasonable market price." And the term should be "price" and not "rate," he said. The latter could imply the fixing of a return to the producer, which the commission wants to avoid.

Some witnesses before the commission, and some of its members, have raised the question whether the provision for acceptance of present contracts would not result in two rate standards. One would be for new contracts, and one for unregulated present contracts. But Kuykendall said this would be all right because "we always have some differences in prices."

"Otherwise, there would be no competition," he added.

Ceiling price . . . Kuykendall agreed with Harris that the bill sets up a new concept—that the FPC shall have authority in the future on new and renegotiated contracts when price increases are requested. Harris said this is designed to protect the consumer. It places a ceiling under which competition may continue, while relieving the FPC of having to pass on contracts which do not involve price increases.

The idea of controlling prices through the pipeline companies rather than the producers has a "lot of virtue," Kuykendall said. It is much better than the utility type of regulation. It still leaves competition, but it puts some controls at the top to prevent abuse. It doesn't tend to give a greater rate of return to the producers or build up monopoly.

There is no need for rate control on industrial sales, as provided for in the Staggers bill, Kuykendall told the committee. The FPC now has to approve the connections for industrial sales to safeguard a sufficient gas supply for resale. In effect, he said, this can be considered control of end use, which is sought by the coal industry. When price increases are granted to pipeline companies, he added, half of the fixed costs involved are assigned to those industrial consumers. Therefore, they are as much subject to price increases as are residential consumers.

The pipeline companies, Kuykendall commented, think the commission goes out of its province in considering these things.

Partial control . . . The split regulation proposed in the Heselton bill will not work, in the estimation of a majority of the power commissioners, Kuykendall said. The bill would exempt the small producers from regulation and would control prices of the 100 or so largest producers only.

Kuykendall pointed out that it would be impossible to apply the Heselton bill in the case of unitized fields or where gas goes through a processing plant whose operator makes the sales for interstate transmission.

But Kuykendall said also that if the FPC has to regulate each producer on a public-utility basis "it is difficult to see when, if ever, we would get out of the woods" in passing on producer sales.

NPC Warns Against Imports

WASHINGTON. — A National Petroleum Council committee warned last week against further increases in imports.

Heavy imports of crude, coupled with a decline in crude exports, already have hurt parts of the oil industry, the committee said in a report presented at the NPC's spring meeting on May 5. More increases could cause serious damage, the report indicated.

The committee, realizing the competitive sides of the question, limited its study to the facts and made no recommendations. However, the findings show clearly what effect foreign oil is having on the domestic industry.

The council also received reports on production capacity and plant protection against enemy attack. To aid with the latter, a manual on protection of facilities has been prepared for publication. The council also heard a tank-truck census report. The census was requested by the Interior Department.

Import Curb Promised

Congress rejects Neely quota plan, gives President control over foreign oil influx; definite restrictions assured

WASHINGTON.—Congress has left it up to the President to decide when imports of foreign oil become dangerous and should be restricted.

The Senate last week in extending the Reciprocal Trade Act voted down the Neely quota system of restricting foreign crude imports in favor of a voluntary plan under control of the President.

The measure was whipped back to the House, which immediately sent it to a conference committee for final agreement.

The action brought a cease-fire in the oil industry's battle over the imports problem. But it will be an armistice and not a real peace.

Whether the war will break out again next year will depend on success of the administration's new approach to oil imports control. This voluntary regulation of imports by the importing companies themselves was proposed by the cabinet fuels committee in February.

Administration's promise . . . Senators representing oil states were assured just before the Neely proposal was beaten that the administration will take a positive approach to the imports problem.

Sen. Frank Carlson of Kansas declared oil imports will be held within the limits suggested by the cabinet committee. Carlson, co-author of the quota plan with Sen. Matthew M. Neely, West Virginia, revealed he had discussed the problem with administration leaders. He supported the compromise plan on the basis of a promise controls would be imposed.

Carlson said: "I was assured by those in the administration responsible for the trade-agreements program that if the amendment were adopted, action would immediately follow and that imports of petroleum and its products would be definitely restricted."

The Kansas senator added he also was assured the restrictions would be based on the cabinet study and that the director of defense mobilization would act to adjust imports to the 1954 levels. He explained: "It is my judgment that, if these assurances can be supported by further evidence, we can all rely upon these assurances and the importation of petroleum and its products will forthwith be limited."

Earlier action . . . The Senate finance committee earlier had written the voluntary control plan into the trade act. The full Senate later accepted the proposal by defeating all efforts to alter it. Teeth of the plan is this:

. . . If it is determined that the volume of imports threatens national security, the President may "adjust" it *(The Oil and Gas Journal, May 2, page 63).*

Senators backing the plan insist it will work. It is a whip over imports that can be snapped if strong action is necessary, they say. It is in line with the cabinet report which called for "appropriate" action if the voluntary control plan failed. And it does not freeze the situation as would the quota sought by Neely.

Domestic producers don't see the voluntary plan in the same light. They feel it is not specific enough. They remember that President Eisenhower refused publicly to endorse the cabinet report, although he later said the amendment was all right. They think the line to presidential action laid down by the committee is too long to be traveled quickly if action becomes necessary. And many believe the question can be settled by nothing less than a permanent quota system.

Both sides agree if the importing companies follow the cabinet committee's recommendation the situation will smooth itself out. The same is true if the President acts promptly when the companies don't. But if both fall down, the problem of oil imports will explode again in Congress next year.

Lower Taxes Urged

Economic research group asks reductions in 1956

WASHINGTON.—Tax reductions to spur industrial expansion have been proposed to the administration for adoption next year.

Present conditions indicate that, barring an emergency, the government budget will be able to stand substantial tax relief in 1956, the Committee for Economic Development said over the weekend.

The C.E.D. is a nonprofit economic research organization of businessmen and educators. The oil and gas industry is represented on its board of trustees by M. J. Rathbone, president, and Jay B. Crane, vice president, of Standard Oil Co. (N.J.); T. S. Petersen, president, Standard Oil Co. of Califor-

Pipeline Submerged in Pacific

Monterey Oil Co. is laying an 8-in. pipeline from Seal Beach, Calif., to its drilling island 8,200 ft. offshore. Also being laid in a 7-ft. trench beneath the ocean are three 3-in. utility lines and a telephone cable. Monterey is now drilling the sixth well from the 75-ft. diameter earth-filled structure, visible in background. Separating and storage facilities will be constructed onshore. The lines will be placed in operation about mid-June.

nia; and H. Carl Wolf, managing director, American Gas Association.

The main emphasis, the C.E.D. said, should be on the lowering of personal income taxes. Rates should be reduced in all brackets, but the greatest reduction should be made in the upper bracket rates, where taxes "are seriously interfering with incentives to take risks and with the supply and mobility of investment funds."

Present corporate income and excise tax rates should not be continued beyond next April 1, the date now scheduled for reduction. The C.E.D. did not fix the amount of reduction. It should be adjusted to the government's revenues, it said.

As a third step, the recommendation for tax concessions on corporate income from foreign sources was renewed. This, the C.E.D. said, would be an important step in the administration's policy of encouraging private investment abroad.

Nine Baytown Bids

Competition proves stiff for last rubber plant

WASHINGTON.—There's plenty of competition for the 44,000-ton synthetic-rubber plant at Baytown, Tex.

Nine bids for the government-owned plant have been received by the rubber disposal commission. Over the next 2 months the commission will play one bidder against another. It wants to get a maximum price for the lone GR-S plant not sold in the big sales program last year.

A year ago, when the commission opened bids for all 27 of the Government's synthetic-rubber plants, only one offer was made for Baytown. That offer was not satisfactory. So the commission refused to sell the plant.

Now the commission has offers from the American Resinous Chemicals Corp., Peabody, Mass.; Baytown Rubber & Chemical Co., Baytown, Tex.; Food Machinery & Chemical Corp., New York; General Tire & Rubber Co., Akron, Ohio; Goodyear Synthetic Rubber Corp., Akron; Edwin W. Pauley, Los Angeles; Minnesota Mining & Manufacturing Co., St. Paul, Minn.; Thiokol Chemical Corp., Trenton, N. J.; and United Carbon Co., Charleston, W. Va.

Food Machinery and Goodyear Synthetic were among buyers of plants transferred last month *(The Oil and Gas Journal, April 11, page 72)*. Pauley and Minnesota Mining protested the "package" sale of three California plants when the disposal program was before Congress in March.

WATCHING WASHINGTON

Bertram F. Linz

Emergency Controls Back

The nation is at peace. But wartime price, wage, and material controls are again in the news.

President Eisenhower reportedly is changing his mind on standby controls. In 1953 he ended what was left of the Korean-emergency controls. Then he made it clear he did not favor standby controls to be applied in the event of another emergency.

Gradually, the President appears to have pulled back from that stand. Early this year he said he didn't think there was any need for a standby-control bill. But he indicated if Congress wanted one he would accept it.

Now, Eisenhower is said to have agreed with his top officials that it might be well to have a bill under which the Government could act quickly in the event of an emergency. Not yet decided is whether he will ask directly for the measure or arrange to have it sponsored by members of Congress.

Also still to be agreed, apparently, is whether the bill shall cover prices and wages and also include material controls. A law now on the books gives a degree of control over materials. It is a temporary act, however, and will expire June 30 unless extended. Any controls the administration decides upon probably will be made part of the extension bill to be considered this spring.

The standby-control provisions, seen as a necessity by many congressmen, would let the President freeze prices and wages immediately in an emergency. It would prevent delays and conflicts which arose in both World War II and the Korean emergency in getting control programs under way.

Next Move Up To Importers

The difference of opinion over the way to control oil imports still goes on.

The Senate finance committee wrote a provision into the Reciprocal Trade Act following proposals of the cabinet fuels committee to let importers regulate themselves. It gave the President a whip over importers. This takes the form of a clause letting him impose quotas or take other action if imports aren't controlled.

The domestic producers agree this is a couple of steps forward. But they say it merely admits that a problem exists. It doesn't correct it. Only the Neely amendment calling for a fixed quota can do this, they say.

The finance committee made it clear its plan was aimed at carrying out recommendations of the cabinet group. It quoted parts of the cabinet report calling for voluntary controls backed by threat of government action. Later President Eisenhower said he thought this was a good way of dealing with the problem *(The Oil and Gas Journal, May 2, page 63)*.

If Congress rewrites the trade act this way, the next move will definitely be up to importers. If they keep imports within limits suggested by the cabinet committee, all will be well. If they don't, the Government might act to put on stiffer curbs.

Oil Marketing Under Fire

Marketing practices of major oil companies got a real going over in congressional committee rooms last month.

The small business committees of both House and Senate called in oil retailers to air grievances against their suppliers. They heard a number of charges against the companies. But it also came out that some filling-station operators also resort to questionable tactics from time to time.

Most generally attacked in the hearings were the exclusive dealing arrangements and short-term leases which some companies make. But the Supreme Court decision in the Standard Oil Co. (Detroit) case also came in for criticism.

The Detroit decision holding that meeting competition in good faith is not a violation of the Robinson-Patman Act opened the way for price wars, it was declared. But these "wars," it was explained, were waged for price control to unload excess stocks or whip retailers into line.

The committees are now studying these charges. They will probably issue reports before the end of the session. The reports will be critical of the suppliers, but it is questionable whether legislation will be suggested.

Automation Test

Gulf Interstate to set up robot compressor station

WASHINGTON.—The first experiment in automation along natural-gas pipelines will be made by the Gulf Interstate Gas Co.

The company was given permission by the Federal Power Commission last week to build an experimental, unattended "satellite" compressor station near Stanton, Ky. The station will be controlled from another station at Clementsville, Ky., 80 miles away.

The robot station will have a 3,500 hp. four-cycle, turbo-charged vertical gas engine, driving a centrifugal compressor through a speed increaser. Company officials said no other unit of this type is being operated by any gas transmission company.

The station will cost about $730,000. It will be tested for 15 months to determine whether this type of operation is practical and economic. If the experiment fails, the company said, it will be able to salvage $450,000 of the money spent on it.

Offshore Rules Outlined

WASHINGTON. — Rules under which rights-of-way will be granted for oil and gas pipelines in the outer Continental Shelf have been written by the Interior Department.

Pipelines built under government right-of-way grants will be classed as common carriers. They will be required to transport or buy without discrimination such amounts of gas as may be required by the Federal Power Commission or oil set by the Interstate Commerce Commission. But such amounts are to be "reasonable" and fixed with an eye to conservation and the prevention of waste.

Rights-of-way will include the area necessary for pumping stations or other equipment. They are not to exceed 100 ft. in width for the pipelines. The Government will charge a rental of $5 per year per mile of right-of-way and $50 for each area in excess of 100 ft. in width. All requirements of the Army Department and Coast Guard for prevention of obstruction to navigation, lights, and warning devices, etc., must be met.

The rules have been published by the Bureau of Land Management. Interested parties have been given 30 days in which to file their comments, suggestions, or objections with the bureau in Washington.

ALASKA

HAINES TERMINAL . . . 620 miles to Fairbanks.

Alaska Line Ready

Haines-to-Fairbanks military pipeline gets first fuel this month; project proved dramatic battle with nature

ANCHORAGE.—Workmen are putting the finishing touches on the Haines-to-Fairbanks military products pipeline system and the first fuel should flow into the lines later this month. Deliveries to Ladd Air Force Base at Fairbanks are expected about September 1.

First shipment will be brought May 25 to Haines, the southeastern Alaska port of entry for the 620-mile system. The 50,000-bbl. delivery will be pumped into huge storage tanks at Haines for extensive tests of all equipment.

After these tests, the fuel will be pumped to various stations along the route to Fairbanks for similar testing of other equipment.

The line will carry diesel, jet, and motor fuels to military bases in Alaska.

Most of the actual construction was completed last fall with the exception of a river crossing. Contractors waited for the winter freeze to move heavy equipment on the ice to drive pilings and complete the highway-type bridge supporting the line.

Tough job . . . Work also continued on wharves, docks, and pump stations. Workers this spring completed "bedding down" the 8-in. steel pipe into final place and installed piping, electrical, and other auxiliary equipment.

Contractors for the line, were Williams Brothers of Tulsa, McLaughlin Construction Co. of Great Falls, Mont., and Marwell Construction Co. of Vancouver, B.C.

The $40 million project began in 1953 and proved to be a dramatic battle against the weather and terrain.

Clearing operations started in midwinter. Big cats cut a 50-ft. right-of-way over frozen tundra in subzero temperatures for pipe-stringing crews in the spring. *(The Oil and Gas Journal, page 72, October 25, 1954.)*

Oldtimers in the Arctic said the permafrost couldn't be ditched. The Arctic muskeg forms a natural insulation for a tremendous field of permanently frozen earth. When the natural insulation is scraped away or churned by heavy equipment exposing the "subsoil" to the sun, it soon becomes a swamp. Ditches are quickly filled with ooze.

New techniques . . . Williams Brothers fabricated its own ditching machine of a special design and dug trenches in 100 miles of frozen soil for the pipe. However, crews reversed the normal procedure of ditching, stringing, welding, and covering pipe because the ditches wouldn't remain open. The pipe was strung, welded, and then put into the ditch following the machines so it could be covered before any mixture of frozen mud and water could slough off the trench.

This resulted in another headache. When the soil began to freeze in the winter, it solidified from the bottom up and shoved the buoyant pipe to the surface. The pipe was reburied with 300-lb. blocks of concrete tied to about every 40 ft. in the most troublesome sections.

Texans Attack Tax Bill

Two big associations throw up strong opposition to move canceling scheduled cut in natural-gas production levy

Robert J. Enright

AUSTIN.—The Texas Senate has inherited a hornets' nest stirred up in the house.

The senate state affairs committee last week began hearings on a house-approved tax bill which would cancel a scheduled drop in the natural-gas production tax. As a result, the committee will listen to a lot of angry oil and gas producers before it's through.

The producers feel that, in return for good faith on their part, they were stabbed in the back.

A year ago the Texas Legislature held a special session to find new revenue to increase teachers' salaries. The lawmakers proposed a whopping increase in gas production taxes—from 5.72 to 9 per cent.

Gas producers did not oppose the move then. They were promised the tax rate would drop to 8 per cent in September 1955 and to 7 per cent the next year. State officials figured the lower rates would produce the same revenue. They felt stepped-up production would provide a larger tax base each year.

But the house in an omnibus tax bill passed last month knocked out the last scheduled reduction. Lawmakers pegged the tax permanently at 8 per cent. Producers claimed they were given no chance to protest the cancellation. The action came on the house floor and was not cleared through committee.

Producers up in arms . . . Last week, the senate committee began to hear from the aggrieved producers. Opening blasts were fired by the Texas Independent Producers and Royalty Owners Association and the Texas Mid-Continent Oil and Gas Association.

Harry W. Bass, Dallas, president of Texas Mid-Continent, said: "Our members, who represent all segments of the producing industry, believe they have been imposed upon enough and are solidly united against this tax law."

The association, Bass said, is convinced the legislature can find other sources of revenue in a step toward equalizing the tax responsibility of all Texas citizens and businesses. He declared fair treatment to the petroleum industry, now paying 67 per cent of the state's business and property taxes, should not jeopardize the financing of schools, roads, and other important state functions.

Brian Payne, Tyler, Tex., independent and a member of TIPRO's legislative committee, also flailed the gas-tax action. TIPRO, he said, is opposed to any further taxes on the oil and gas industry as long as other industries "remain relatively untaxed." There is no more reason why natural gas should be singled out for an 8 per cent of value tax at point of production, he said.

Payne added the Texas petroleum industry has long tried to persuade the legislature to undertake a comprehensive tax study aimed at broadening the tax base. TIPRO, he said, feels the legislature will do this only if:

. . . **"Favorite tax targets,** especially natural-gas producers, reach a point where they obviously cannot survive greater burdens or

. . . **"Those having to bear** these ever-increasing tax burdens take upon themselves the obligation of resisting further taxes with all possible vigor."

This latter course, Payne said, has been adopted by TIPRO.

In other actions, the senate passed a bill validating oil and gas leases signed by cities and water districts. It followed the house in permitting all firms which paid the defunct gas-gathering tax without protest to sue the state for recovery.

Unit bill dead . . . Slow legislating progress of both houses resulted in death for another oil bill—Rep. Reuben Talasek's compulsory-unitization measure. This bill would have permitted receivers to be named for properties whose owners refused to go along with unit operation when a majority of mineral owners favored it. The unit previously would have required approval as a conservation measure by the Texas Railroad Commission.

Talasek said he decided to let the bill die. It had slight chance passing due to lateness of the session and to the bill's low position on the calendar.

Price battle continues . . . Supporters of the TIPRO-sponsored economic-waste gas-price bill fought successfully last week to keep their measure alive. It still is highly doubtful it will pass before the session ends. The house voted down, 74 to 54, a motion to send the bill back to committee for further study. An affirmative vote on the motion, coming this late in the session, would have killed the bill.

The senate's oil, gas, and conservation committee meanwhile voted to postpone consideration of the economic-waste measure and other gas bills indefinitely—probably due to the house's refusal to take up the bill late last month.

New Texas Oil Area

Conoco gets production in Maverick County well

EAGLE PASS, Tex.—Maverick County in far-southwestern Texas got its first oil production and second field last week.

The discovery well was drilled by Continental Oil Co. on the large, long-known Chittim anticline, 18 miles east of here and 5 miles west of the Zavala County line. It came in flowing at the rate of 157 bbl. of 28°-gravity oil per day, gaged through ⅛-in. choke.

During a full 24-hour gage through 3/32-in. choke, it produced 104 bbl. Pressure through the ⅛-in choke was 780 psi. Gas-oil ratio was 270 cu. ft. per barrel.

Production is from crevices in the Upper Cretaceous Austin chalk, drilled to 4,134 ft. and having hole open from 3,109 ft., bottom of the casing.

The oil discovery is 10 miles southeast of the old Chittim ranch gas-distillate field, on the same anticlinal structure. That field, only other production in the county, was discovered by Rycade Oil Corp. in 1930. It now is operated by Texas Gas Utility Co., and produces from the Lower Cretaceous-Glen Rose formation at depths of 5,500 to 5,600 ft. Five gas wells were completed, the last in 1938. Three wells are still producing.

Nearest other production is in the Carrizo Springs district of northwestern Dimmit County, 30 miles to the southeast. Main production there, both oil and gas, is from the Upper Cretaceous-Olmos (Navarro) formation.

Continental's discovery well marks the first drilling activity in Maverick County in many years. Continental is starting two additional wells, one 2,344 ft. west, and the other 1,616 ft. east of the discovery well. The former is projected to 8,000 ft. for a test of lower horizons as was originally intended in the discovery well. The other will be carried to the discovery well's

pay. A lighter rig is being moved in for it.

The discovery is the second within as many weeks in the remote, sparsely populated region of Southwest Texas. It follows Phillips Petroleum Co.'s deep gas-condensate strike in the Vinegarrone area, of northeastern Val Verde County, 100 miles northwest *(The Oil and Gas Journal, May 2, page 61)*.

For additional information and map see page 171.

Multizone Unit Sought

Project would increase oil recovery from Columbus field by estimated 6,000,000 bbl.; other programs approved

AUSTIN.—Cities Service Oil Co. and other operators in Columbus field of Colorado County, West Texas, are planning to unitize the field and carry out a pressure-maintenance program which would recover an extra 6,000,000 bbl. of oil and additional large quantities of gas liquids.

The unit agreement will cover 14 producing oil and gas zones down to 12,000 ft., as well as any other zones above this depth which may become productive in the future. Seven of the zones involved produce gas, the rest gas and oil.

The pressure-maintenance program concerns only those producing oil. At a Texas Railroad Commission hearing, Gene E. Roark, of James A. Lewis Engineering, Inc., said the area is one of low relief, lending itself to water injection on the flanks and gas injection in the gas caps.

Roark said four of the oil zones—the 7-C, 9-B, 11-A, and north segment of 11-F sands—look particularly attractive from a pressure-maintenance standpoint. These four major oil zones have expected primary recoveries ranging from 87.9 to 137.8 bbl. per acre-foot and ultimate recoveries (with pressure maintenance) of from 137.3 to 200.3 bbl. per acre-foot.

Primary recoveries were estimated at 19.7 to 27.7 per cent of total oil in place and ultimate recoveries at from 30.7 to 43.2 per cent. Gas in the gas caps has a liquid content of about 71 bbl. per million cubic feet.

Roark said his studies showed that cycling of the gas zones would not be feasible.

Cities Service's plans are backed by Commercial Petroleum & Transport Co., Texas Gulf Producing Co., Ralph Fair, Inc., and other working-interest holders. Sinclair Oil & Gas Co., the only operator in the field which has not yet signed the working-interest agreement, has indicated by letter that it will sign. More than 93 per cent of royalty owners have agreed to go along with the project.

Hayes-Ezzell unit . . . The Railroad Commission voted approval last week of Murphy Corp.'s plans to unitize and expand a pilot water flood in Hayes-Ezzell Ranch field.

The unit and flood would involve roughly 2,500 acres and result in recovering an extra 1½ to 2 million barrels of oil from the 18-year-old field. It has produced about 3,000,000 bbl. of oil to date—a considerable amount of this due to the pilot flood, begun in November 1953, and to gas injection since 1941.

Two other projects . . . The Railroad Commission also approved a unitization and gas-injection project in Spraberry Deep field of Dawson County, West Texas, and another calling for injection of gas into three producing formations in Tijerina-Canales-Blucher field in Jim Wells County in the southern part of the state.

The Spraberry Deep program, ramrodded by Seaboard Oil Co., calls for cycling about 83,000,000 cu. ft. of casing-head gas daily into the 6,400-ft. Spraberry sand. Additional oil recovery is estimated at about 1,000,000 bbl. The unit takes in 2,400 acres, 1,650 of them productive.

The Texas Co. got the green light to inject a total of about 3,000,000 cu. ft. of gas daily into the No. 2, First Tijerina lower, and Second Tijerina sands in Tijerina-Canales-Blucher.

Companies Plan Merger

ALBUQUERQUE.—The presidents of Albuquerque Associated Oil Co. and Bolack Oil & Gas Co. have announced plans to merge the two firms.

Both firms have interests in the San Juan basin. Albuquerque Associated would take over all Bolack assets. These include 50,000 acres of oil and gas leases and 78,000 acres of uranium prospecting permits in New Mexico.

The merger is subject to approval by stockholders of both firms. This is expected since Atlas Corp., which holds a third of Albuquerque Associated outstanding shares, has already indicated its approval of merger plans.

Lea Gets New Zone

Two structures tapped in Amerada New Mexico well

HOBBS. — Another producing structure has been assured in the chain of fields along the western side of northern Lea County, New Mexico.

Amerada Petroleum Corp. 1 State "SRA," 8 miles northeast of Caprock, flowed at the rate of 37 bbl. an hour from the Pennsylvanian at 9,105-9,260 ft. It recovered oil on drill-stem tests over more than 50 ft. of Devonian section from 11,152 ft. Operators were running electrical surveys following the Devonian tests.

Nearest Pennsylvanian and Devonian oil is in Mescalero field, 7 miles to the south of Amerada's strike.

Magnolia Closes Refinery

FORT WORTH.—Magnolia Petroleum Co. has shut down its 13,320-bbl. refinery here. The company said the 40-year-old plant had lost money for several years.

The Fort Worth plant went on stream Christmas Day 1914. Thermal facilities when it closed included 8,325 bbl. of cracking, 1,988 bbl. of reforming, and 5,883 bbl. of coking capacity daily. It could produce daily 1,887 bbl. of cat-poly gasoline and 127 tons of coke.

Magnolia plans to use the plant site for a small-scale terminal operation. Refinery equipment will be dismantled and some shipped to the company's 200,000-bbl. Beaumont plant.

The shutdown leaves Fort Worth with only one refinery, a 7,500-bbl. plant operated by Premier Oil & Refining Co.

Duplicate Line Planned

SWEETWATER, Tex.—Sohio Petroleum Co. will build a gathering system and new pipeline outlet to handle about 80 per cent of the 4,000 bbl. per day

of crude produced in the White Flat field, Nolan County, Texas.

Magnolia Petroleum Co. formerly purchased all of the White Flat crude, and the new gathering system will largely duplicate the Magnolia line. Sohio's project will include a short line linking the field with North Dora field. The oil will be moved about 30 miles to Roscoe in western Nolan County where it will enter West Texas Gulf Pipeline Co.'s trunk system, of which Sohio is part owner.

In addition to buying a big percentage of the White Flat crude, Sohio also contracted for liquefied petroleum gas produced there at the new natural-gasoline plant operated by Honolulu Oil Corp.

CANADA

Octane Race Hot

British American will add reformers at three plants

TORONTO. — British American Oil Co., Ltd., plans to add three more catalytic reformers at its Canadian refineries. The firm recently completed a similar unit at Calgary and has one building at Montreal.

D. L. Campbell, vice president for manufacturing, explained at the company's annual meeting that Canadian octanes are trending upward. He declared the company, as a result, is preparing to maintain its position on gasoline quality.

Campbell revealed British American also is increasing the amount of domestic crude it processes. Western Canada will provide 46 per cent of its supplies this year compared with 40 per cent last year, he said.

Reports that one auto maker is coming out next year with a 10-to-1 compression ratio engine will spur the octane race. But Campbell warned that the refiner may have to pass added costs on to the consumer. This will come, he explained, if additional refining costs are not accompanied by a reduction in price of crude. Higher efficiencies in future automobiles should bring lower fuel costs per mile for motorists, however.

Campbell explained if the gas turbine engine makes its appearance by 1960, refiners' plans for increased octane motor fuel will have to be altered. If this takes place, Campbell expects octane quality to remain essentially stable during the estimated 15-year transition period. But premium gasoline will gain a greater percentage of total market.

British American recently completed a 2,000-bbl. per day Catforming unit at its Calgary refinery and a 13,000-bbl. Catformer is now building at Montreal. Campbell said the new units will be added at refineries in Clarkson, Moose Jaw and Edmonton.

Gas System Sale Near

OTTAWA.—Agreement has been reached for selling the gas manufacturing and sales division of the Quebec Hydro-Electric Co. for $30 million. Purchaser is a company formed by principals of Trans-Canada Pipe Lines, Ltd.

Frank Schultz, Trans-Canada vice president, said the purchase will be financed by a $20 million Bank of Canada loan and by sale of debentures and common stock. An $18 million expansion program is planned in Montreal, converting the distributing facilities to natural gas *(The Oil and Gas Journal, May 2, page 60)*.

Westcoast Gets More Gas

CALGARY.—Westcoast Transmission Co., Ltd., will increase by one-third its natural-gas take from the Peace River area of northern Alberta.

The provincial government last week by order in council authorized the company to take 56 billion cubic feet yearly instead of the 42 billion previously allowed.

The amendment to the company's permit, the third since the original was granted in 1952, stipulates 21 producing areas from which the gas may be taken.

Petrochemicals for Canada

EDMONTON. — Five new petrochemicals will be added to the growing products list at Canadian Chemical Co.'s Edmonton plant this summer. The five will be the first made in Canada. They are methyl isobutyl ketone, butylene glycol, methyl ethyl ketone, methyl isobutyl carbinol, and glycol ethers.

They will bring total plant ouput to 20 different products plus various solvent mixtures. The giant plant charges propane and butanes obtained from nearby refineries operated by Imperial Oil, Ltd., and McColl-Frontenac Oil Co., Ltd. Bulk of chemical production is in alcohols, aldehydes, ketones, glycols, and acids.

Financing Security Claimed

OTTAWA.—Gas sales contracts already signed and others to be obtained within the next 6 months will be adequate security to finance the $350,000,000 Trans-Canada Pipe Line, according to N. E. Tanner, Trans-Canada president.

Tanner made the forecast in supporting his application before the Federal Board of Transport Commissioners for 6-month extension to October 31 of the deadline to complete financing for the project.

The extension was granted by the board. If the 2,200-mile line is financed, actual construction will start by June 30, 1956 *(The Oil and Gas Journal, May 2, page 60)*.

Magnolia Kicks Off Crude Line

Here's the start at Midland of a 14 and 16-in. crude line which Magnolia Pipe Line Co. is laying from Midland to Corsicana, Tex. The 215-mile line is being laid by two contractors. O. R. Burden Construction Corp., Tulsa, has the western section and H. B. Zachry Co., San Antonio has the eastern section. Pipe was yard coated in Houston by Mays Brothers, Inc., and trucked to location. The line is scheduled to be completed by October 1.

Gas Storage to Expand

More underground facilities planned in Los Angeles area to meet future demand of big Southern California market

D. H. Stormont

PALM SPRINGS, Calif.—Additional underground-storage reservoirs are planned in the Los Angeles area to help meet the growing demand for natural gas.

R. W. Todd, of Pacific Lighting Gas Supply Co., said storage facilities now operating in the area can supply more than 700 million cubic feet of gas daily. During off-demand periods, they can store about 185 million cubic feet of Texas gas daily.

Experience gained from several years' operation of the large-diameter gas carriers between Texas fields and California markets indicates underground storage may become an even more vital factor in supplying growing markets in this area. Because of the high load factor already involved in the big gas carriers, efficient service depends greatly on off-season storage.

This experience also has stressed the importance of corrosion prevention, fire protection, and aerial patrolling in reducing the number and severity of pipeline failures.

Speaking at the Pacific Coast Gas Association's transmission conference here last week, Todd stressed the importance of underground storage in supplying the big California market.

The company's newest project at East Whittier, Calif., is ideal in one way. Its location, close to the large Los Angeles market, permits it to be operated in much the same manner as aboveground gas holders. But, as Todd pointed out, its nearness to residential areas creates numerous development and operating problems.

This reservoir, with a working capacity of 1,400,000 M.c.f., is adjacent to La Habra Heights, 20 miles east of Los Angeles. To keep the good will of its neighbors, the company imposed stringent traffic controls during construction of the 2,700-hp. compressor station.

To keep noise down, soundproofing and other noise-abatement steps were taken. Special pains were taken in designing and painting buildings. Landscaping experts were consulted on safety requirements as well as from the standpoint of appearance.

Since operations are being carried on without serious objections from the company's new neighbors, Todd said other such storage projects are planned for the Los Angeles region. One planned acoustically designed compressor plant ultimately will have 11,650-hp. capacity.

Emergency planning . . . Precautions against line failures were discussed by F. E. Wilson and H. P. Prudhomme, Pacific Gas & Electric Co. engineers.

Until the company's 34-in. line from Topock, Ariz., to San Francisco is looped, a line failure could cause distress in the bay area. Foreseeing this, the company has devised plans which are expected to limit down time to less than 12 hours in most cases.

Increases in manpower and maintenance stations were not the answer. Best methods to cut down time to a minimum were found to be:

. . . Giving maintenance crews fast mobile equipment.

. . . Adoption of such modern aids as shutoff devices and adequate radio facilities.

Aerial patrolling of the line, undertaken last December, has proved less expensive—20 cents per mile as compared to 37 cents by car. More important than the savings, the spokesmen declared, was the better observation provided.

Corrosion prevention . . . N. K. Senatoroff and W. M. Schilling, of Southern Counties Gas Co. of California, declared that the company's 212-mile portion of the big Texas-California gas carrier was designed to be corrosion free.

In the nearly 8 years of its operation there have been no leaks. Continuing studies indicate none should be expected.

Cost of applying cathodic protection to the 388 miles of pipe was estimated at $103,000. This investment, they said, was 0.44 per cent of the $23,650,000 cost of the original line and almost complete loop. Cost of coating the pipe was $1,181,000 on the original line and $976,000 on the loop, or 9.14 per cent of the total investment.

Fire protection . . . Elaborate systems are used to prevent fires at the two gas-turbine booster stations on the Southern California line. These systems are believed to be the only ones of their kind in such service.

Described by E. E. Taylor, Southern California Gas Co., and L. J. Fast, Southern Counties, the systems separately detect and control fires in the turbine room and in the compressor and duct-room areas.

Should a fire occur in the latter, a system of relays goes into effect within a few seconds. It first trips the emergency shutdown system, cutting off the turbine and blowing down the station piping. Then, in rapid sequence, the system starts the emergency fire pump, sounds an alarm horn, transmits a radio alarm to the stations at Blythe and Indio, and turns off the foundation ventilation fan.

Sixty seconds after a fire is detected, water is sprayed from fog heads in the duct room and compressor areas only. The time delay is to allow the operator to attempt to extinguish the fire. At the end of a 3-minute period a timing device shuts down the water pump unless the detectors are still "seeing" flames.

Tidelands Bills Studied

SACRAMENTO.—Four bills opening California's tidelands to exploration and leasing are being considered by the state assembly. They already have received favorable votes by legislative committees.

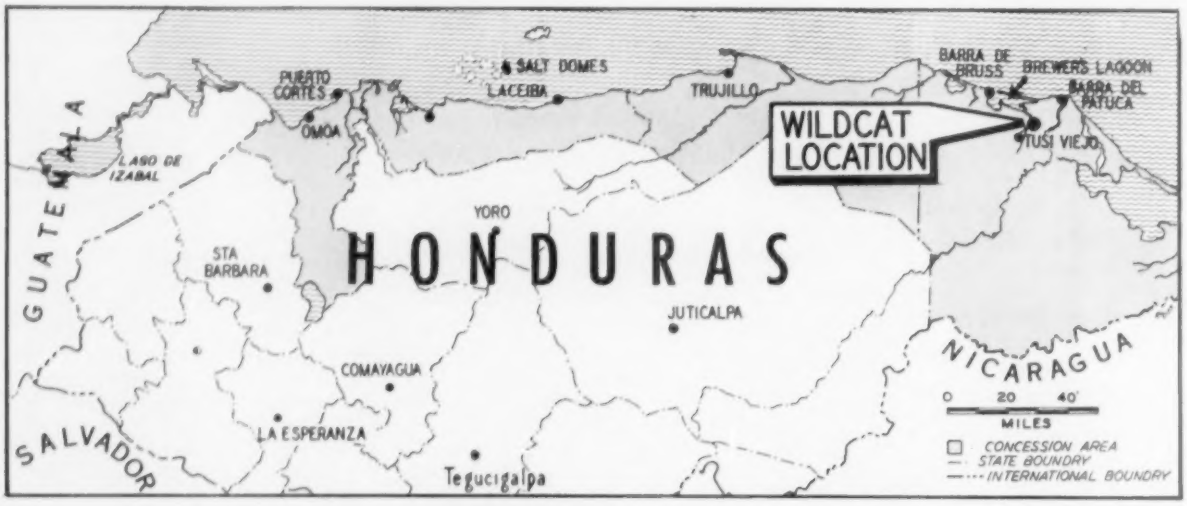
Although amended, the measures still provide 12.5 per cent royalty and a cash bonus for the state with drilling allowed from platforms as well as earth-filled islands.

Conoco Plans Water Flood

LOS ANGELES.—Continental Oil Co. will inject ocean water this month in a pilot flood at its San Miguelito field near Ventura.

Plans call for 2,000 bbl. of brine initially to be injected into a Grubb fault-block pool at a depth of about 9,000 ft. Effect of the injected water through a single well will be observed in four adjacent producers through use of tracers. Water from the Pacific Ocean will be chemically treated and filtered before being injected.

Continental engineers expect the 25 per cent oil recovery obtained by primary means will be duplicated by water flooding.



Texans Begin Oil Search in Honduras

Group granted 20-year mineral concession on nation's north shore; same firm negotiating for rights in Nicaragua

Robert J. Enright

A ROTARY rig has been shipped out of Corpus Christi to open what may become an extensive search for oil in Central America.

The 8,000-ft. portable rig is headed for Honduras. It will be put to work by Compania Petrolera Hondurena, S.A. The firm expects to spud in a wildcat by May 15 on the Honduran north (Caribbean) coast not far from the Nicaraguan border.

Compania Petrolera Hondurena is a Honduras company formed by a group of Americans and capitalized at 400,000 lempiras (about $250,000). It is headed by John L. Sullivan, president of Texon Drilling Co. and of Sullivan & Garnett, both Corpus Christi firms.

Other officers are David C. McCord, Dallas lawyer, executive vice president; O. R. Seagraves, long-time independent operator of Dallas, vice president; Earl C. Cooper, of Tegucigalpa, Honduras, secretary; and G. Sullivan, Corpus Christi, treasurer.

Major oil companies long have considered Honduras a poor bet as a large producing area. But the present American group after several years of negotiation obtained a 20-year concession last July. They won from Honduran President Don Julio Lozano and other government officials right to explore for and exploit oil, gas, coal, iron, sulfur, and manganese deposits.

The concession area takes in about 48,000,000 acres along the country's 315-mile north coast. About 16,000,000 acres of the total is upland grasslands. The remainder is in coastal bays and islands and on the Continental Shelf which extends roughly 30 miles out into the Caribbean.

The American group isn't concentrating on Honduras alone, according to McCord. He helped Honduras write its new oil law last year and was the prime mover in obtaining the concession. He said last week the same combine also is negotiating an exploratory concession covering all of neighboring Nicaragua.

He said details have been worked out and that A. Somoza, president of Nicaragua, is expected to issue the permit within a week.

The hottest spot in Central America currently, however, is just across the Honduran frontier in Guatemala. There nearly a dozen American oil firms are scrapping for a concession in the area surrounding Lago de Izabal near the Honduran-Guatemalan border. Companies competing for these rights are reported to include Gulf Oil Corp. and Cities Service Oil Co.

Another Central American country—British Honduras—figured in the news last week.

American Gulf Oil Co., Gulf Oil Corp. subsidiary, announced it will spud a wildcat soon in the country. American Gulf has been exploring the small country for 3 years. The wildcat will be British Honduras' first deep test.

Honduran venture . . . The American group which will direct the Honduran search has been quietly active in that country for almost 4½ years.

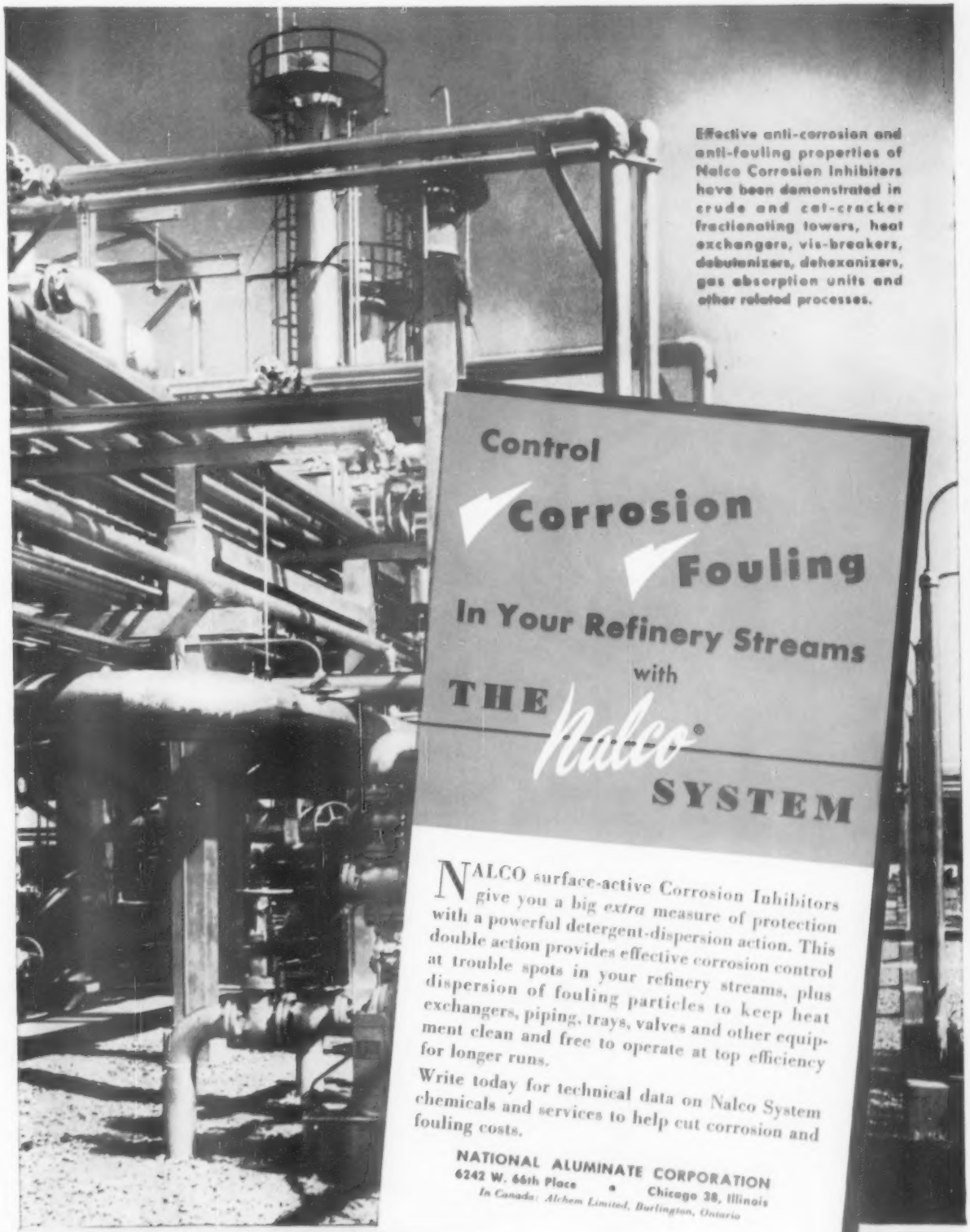
The group initially secured a permit covering the entire country. Last year it obtained its present exclusive exploration and exploitation concession after carrying out about 30 months of geological surface reconnaissance. The coastal area outlined on the accompanying map plus the offshore acreage was selected as having the brightest prospects.

Compania Petrolera Hondurena is spotting its first wildcat near Tusi Viejo on the south shore of the Laguna de Cartina . . . Americanized, it's Brewer's Lagoon. This is in the Mosquitia Territory of Honduras about 80 or 90 miles from the Nicaraguan border.

The well will test "an interesting anticline and several pressures domes" picked up during the surface reconnaissance. Oil seeps are found in this area as well as on the other end of the Honduran Caribbean coast near Puerto Cortes.

The wildcat will be carried to at least 5,000 ft. Company officials believe that any production found will be above this depth. They do not expect difficulty in getting the rotary on location. Terrain near the well site and along a 40 to 50-mile-wide coastal belt is flat and grassy—closely resembling the Texas Gulf Coast plain. Inland from this belt is jungle which blankets

(Continued on page 100)



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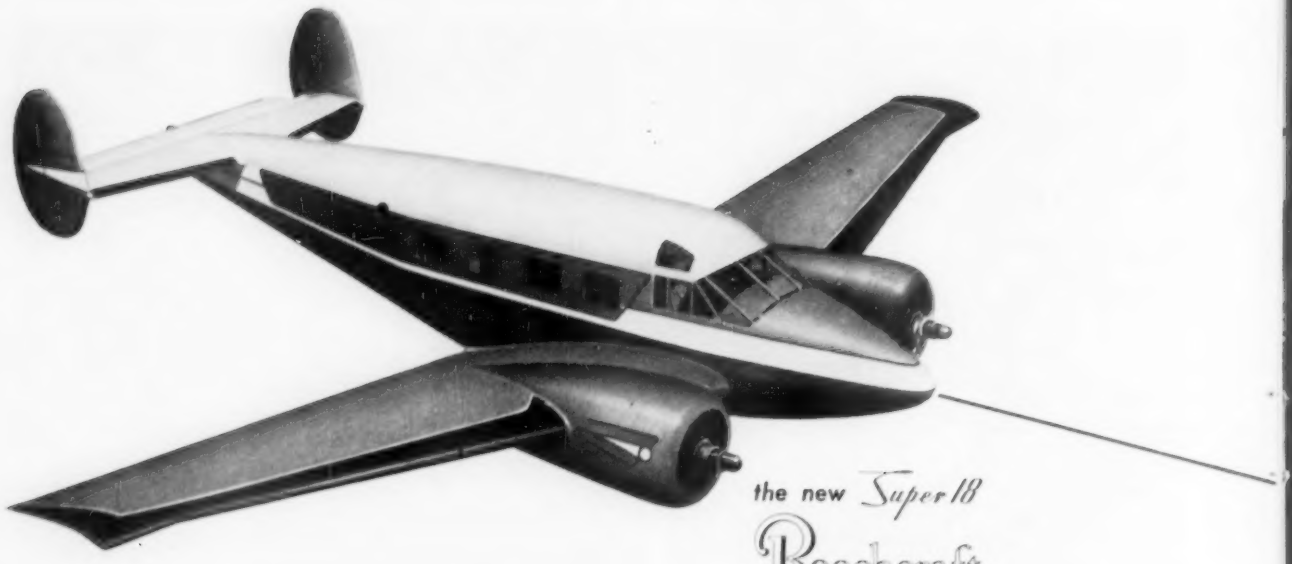

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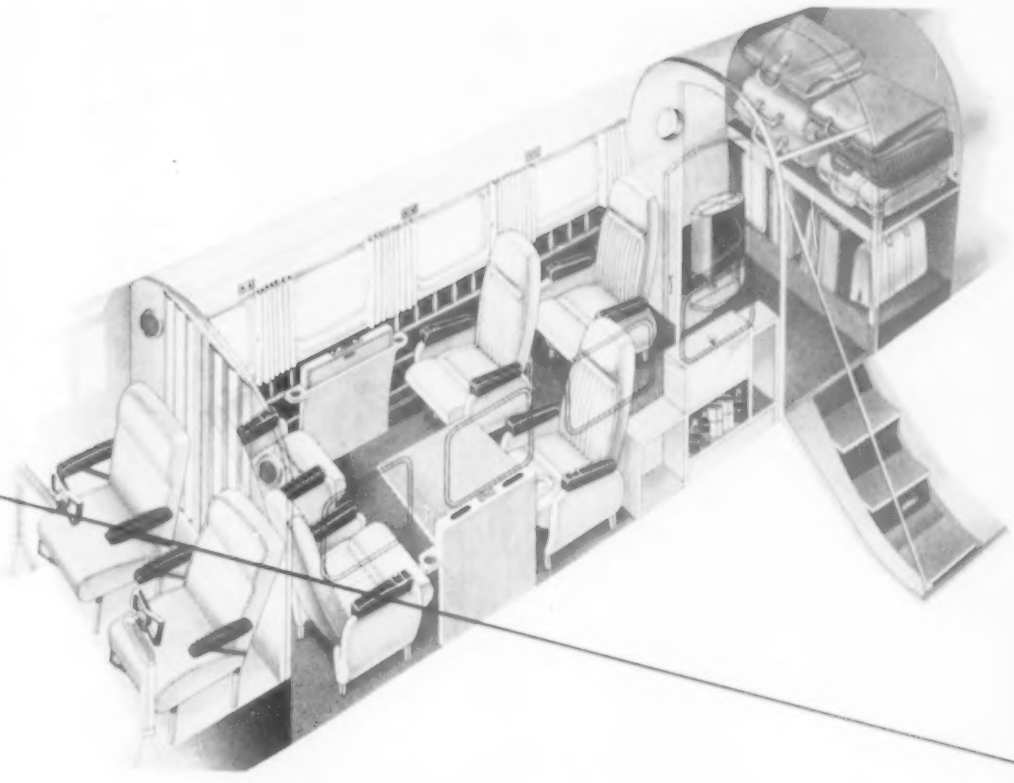

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Rochester, Minn.—Gopher Aviation, Inc.
Rochester, N. Y.—Page Airways, Inc.
Salt Lake City—Kemp & Kelsey Airservice, Inc.
San Antonio—Alamo Aviation, Inc.
Shreveport—Currey Sanders Aircraft Company, Inc.
Teterboro and East Boston—Atlantic Aviation Corp.
Topeka—Topeka Aircraft Sales & Service
Tulsa—Tulsair Distributors, Inc.
Vandalia—Ohio Aviation Co.
Van Nuys—Norman Larson Company
Wichita—Aircrafters, Inc.
Wilmington—Atlantic Aviation Service, Inc.
Youngstown—Youngstown Airways, Inc.

the country to the mountain range along the Pacific Coast.

Further exploration . . . While the first test is drilling, the company will conduct further exploration.

It has engaged Explorations International, Inc., a new geophysical service firm headquartered in Havana, Cuba, to carry out seismic surveys over the entire concession area beginning this month.

The vice president of Compania Petrolera Hondurena, O. R. Seagraves, also is an officer of the geophysical firm. John Freaud, formerly of Marine Geophysical of Houston, resigned recently to join Explorations International.

A complete survey of the offshore acreage, according to McCord, is expected to be completed by October. Detailed seismic exploration of the land area will take somewhat longer.

Offshore, Compania Petrolera Hondurena is particularly interested in an area from about 5 to 12 miles off the port of La Ceiba where it has found about a dozen salt domes.

Water depth over the submerged-lands portion of the concession ranges up to about 150 ft.

In addition to the oil seeps at opposite ends of the Honduran north coast the company thinks it has found large amounts of sulfur midway along the coast near Trujillo and farther east near Barra del Patuca.

Little to go on . . . Little is known of Honduran sediments. So far as the company can determine, only three wells have been drilled in the country and none of these went below 560 ft.

According to McCord, Anglo-Persian Oil Co., Ltd., drilled two tests to about 500 ft. more than 50 years ago. One of these was near Juticalpa in the State of Olancho in the interior. The other was near Omoa on the north coast near the Guatemalan border. Reports are that the company found asphalt in the Juticalpa test, nothing in the well near Omoa.

Another report, sworn to by several Hondurans, is that United Fruit Co. encountered flowing oil production in a well drilled for water near Puerto Cortes. Reports say this well went to 560 ft. and drilled through 31 ft. of saturated oil sand before being abandoned.

Terms of concession . . . Compania Petrolera Hondurena's 20-year concession provides automatic exploitation rights.

The company would retain 75 per cent of net profits from production, with the other 25 per cent going to the government. Drilling must be started within a year from effective date of the concession—which means it must be under way before July 17 this summer or the firm forfeits a 10,000-lempira bond.

If oil or gas is discovered in paying quantities, the company must build at its own expense a public school and a hospital for workers and families at the largest community in the immediate area as a bonus to the government. It also must provide low-cost housing for its Honduran workers who must comprise at least 75 per cent of the company's payroll.

The contract provides a royalty of 2 per cent of net production to the owner of the privately held surface acreage. On national lands, it provides for a payment to the government of 1 lempira per hectare over and above the 25 per cent share of net profit.

The government reserved the right to take its share either in oil or cash.

All equipment, fuel, and other supplies imported for the search are exempt from customs duties for 10 years. All national or municipal lands are available as sites for construction by the company of buildings or other required structures.

Any disputes over interpretation of terms of the contract which could not be resolved by negotiation between company and government would be settled in Honduran courts under Honduran law. The company is forbidden to resort to "diplomatic channels."

The new oil law . . . The terms of the concession contract largely coincide with terms of Honduras' new and more liberal oil law.

In this law, the government declared a petroleum industry in the country a public necessity and gave it preference over any other in use of the land. Any firm carrying on oil operations in Honduras, the law declares, has the right to expropriate any surface property upon paying the owner of the land an indemnity.

The government made it clear that by petroleum industry it includes exploration, drilling and production, pipelining, and refining.

A concessionaire discovering oil, or any other company or individual, may build transmission lines or refineries in the country on applying for and obtaining a permit from the government. Permits also will be issued by the government to export petroleum.

A pipeline, however, is under obligation to carry oil belonging to the government up to 50 per cent of its capacity. There are no similar requirements in the law relating to processing of government product in refineries, gasoline or cycling plants.

Exploitation concessions, limited to 20 years, can be renewed on expiration if terms of the contract have been met.

A concession can be voided by the government on any serious violation of the oil law or the country's criminal laws. It can also be annulled, if it is an exploration contract, for suspension of operations for more than 3 months . . . for more than 6 months in the case of exploitation, pipelining, or refining contracts.

The law gives the government the right to tax the local oil industry but provides no specific rates.

Nicaraguan operation . . . The way was cleared for the American group in Nicaragua when President A. Somoza recently cancelled what is known as the Discoto Miguel concession.

The concession was obtained by Discoto Miguel, formerly Nicaraguan consul general in New York, who subsequently worked out an agreement with Gulf Oil Corp. and Atlantic Refining Co. to take over and develop the area.

Gulf and Atlantic entered the country in the early 1940's and were supposed to have spent several million dollars in a fruitless search for oil there before turning the concession back to Miguel.

Somoza maintains, however, that oil was discovered in this search but was capped and never produced. At present, it is entirely up to Somoza to negotiate concessions and issue permits. Nicaragua is expected soon, however, to legislate an oil law patterned after the new Honduras measure.

McCord said his group has contracted with Marine Geophysical for exploratory work in Nicaragua which will commence as soon as the official permit from Somoza comes through.

New Show in France

Small amount of oil found in test east of Parentis

A SMALL amount of medium-gravity crude has been found by Esso Standard S.A.F. in its Mothes exploratory well about 7½ miles east and slightly north of Parentis field in southwestern France.

The well was drilled to 2,925 m. (9,597 ft.). Six barrels of oil and mud were obtained in a 2-hour test of the interval at 2,413-21 m. (about 7,900 ft.). The limestone section was believed to be Lower Cretaceous. Gravity of the oil was 28° A.P.I.

The Esso company, which made the important Parentis discovery in April 1954, has drilled four unsuccessful exploratory wells on its 4,200,000-acre concession. One of these was the Mano well which preceded the Parentis discovery.

About 5 miles south of Parentis, the

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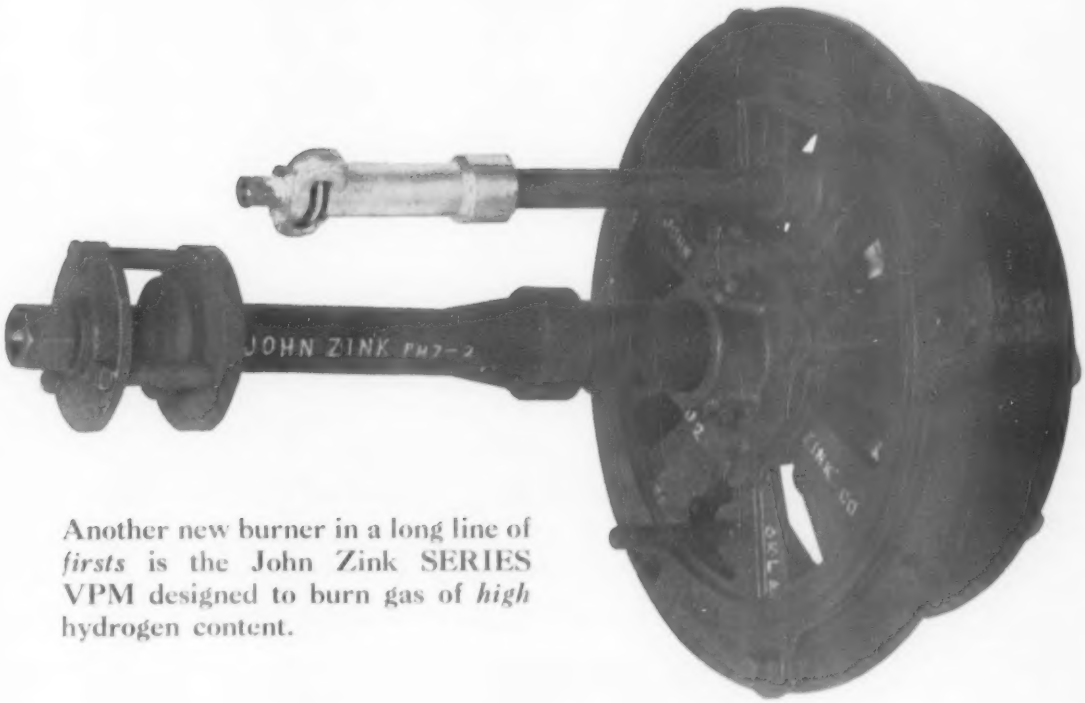

Another new burner in a long line of *firsts* is the John Zink SERIES VPM designed to burn gas of *high* hydrogen content.

Burns with a short and crisp flame with primary air door open. The new high efficiency aspirator on the SERIES VPM burner makes it possible to switch from a *high* hydrogen gas fuel to natural gas.

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Pontex wildcat, on another local feature, was drilled to 8,883 ft. before being abandoned as dry. In the southeast corner of the concession, the Bouglon test was taken to 9,730 ft. before abandonment in what probably was Carboniferous. There were faint shows in the Triassic in the Bouglon well.

A second well is now being drilled at Carcans about 25 miles northwest of Bordeaux. The No. 1 well tested a small amount of oil in a second sidetracked hole. The formation was tight, and basement schist rocks were encountered at about 5,900 ft. Carcans 2 is about 2 km. southwest of No. 1 on the flank of the structure. Drilling is continuing below 5,900 ft.

Parentis activity . . . The company is running five rigs, three in exploratory operations. Location has been staked for another exploratory test near the village of St. Martin northwest of Libourne and east of Bordeaux.

The two rigs operating in Parentis field are now at Nos. 12 and 13. So far, five wells are producing from the main horizon of the field. These are Nos. 1, 3, 5, 8, and 9.

No. 13, now being drilled, is an infill well, and No. 12 is a stepout to the northeast. No. 4 is a small edge producer from the top of the section. No. 2 was dry, and No. 11 is to be drilled in the lake which covers part of the structure. Nos. 6 and 10 have not yet been drilled. No. 7 is classed as doubtful, with small production possible.

The company is preparing to begin its first operations in the lake. A barge must first be constructed for driving pile in the water, which is 15 to 20 ft. deep.

Parentis is now producing about 10,000 bbl. of oil per day. Production is moved by pipeline to a nearby railhead.

Peru Gets Offshore Pay

Douglas Oil Co. is completing an offshore test as a producer in a newly discovered zone of Peru's Lobitos area.

The well was bottomed at 7,050 ft. It was directionally drilled to an underwater structure from an on-shore location. The offset well penetrated oil sand in the basal Salinas zone between 6,893 and 6,960 ft.

This zone was discovered on-shore in July 1954 by Cia. Petrolera Lobitos, which now has two producers in the area. D-7 extends the zone to Douglas' 1,500-acre Lobitos concession offshore. The zone also may underlie the company's Pacifico concession in that area.

If completion is successful, the well will be the third producer out of five deep tests Douglas has made in Peru.

Israeli Tests Dry

Two wildcats abandoned, two others suspended; but active exploration program is being pushed at other locations

TWO deep wildcats undertaken in Israel during the last 6 months have been abandoned and two others suspended, but the exploratory program there is continuing with several new locations.

Latest test to be abandoned was the Tel-es-Safit well of Israel Mediterranean Petroleum, Inc., and Pan Israel Oil Co., Inc. The hole was taken to 8,407 ft. Location was 25 miles southwest of Jerusalem.

Earlier, Lapidoth - Israel Petroleum Co., Ltd., abandoned its Beeri well on the coast south of Gaza. This test went to just short of 10,000 ft.

Israel - American Oil Corp. late in April suspended its Rekhme wildcat located 25 miles south of Beersheba in the Negev. It was drilled to a depth of about 9,000 ft. before being abandoned as a dry hole.

An Israel Continental Oil Co., Ltd., well, drilled by Pontiac Petroleum Co., on a farmout, is listed as suspended at about 9,400 ft. This is the Carmel 1 test near Haifa. The company is reported to be waiting on 3½-in. drillpipe.

New tests . . . A new test has been undertaken by Israel Mediterranean and Pan Israel in the Kurnub area in the Negev. These two companies are identified with the Pantepec Oil Co. interests, and Pantepec's subsidiary, Tri-Continental Drilling Co., which handled the Tel-es-Safit well and is in charge of the drilling in the Kurnub area.

Pan Israel-Israel Mediterranean encountered encouraging gas shows in the Kurnub test early in May. The shows occurred at a depth of 785 ft. as the crew was preparing to set surface pipe. Preparations were being made to finish setting the pipe and core the section before testing.

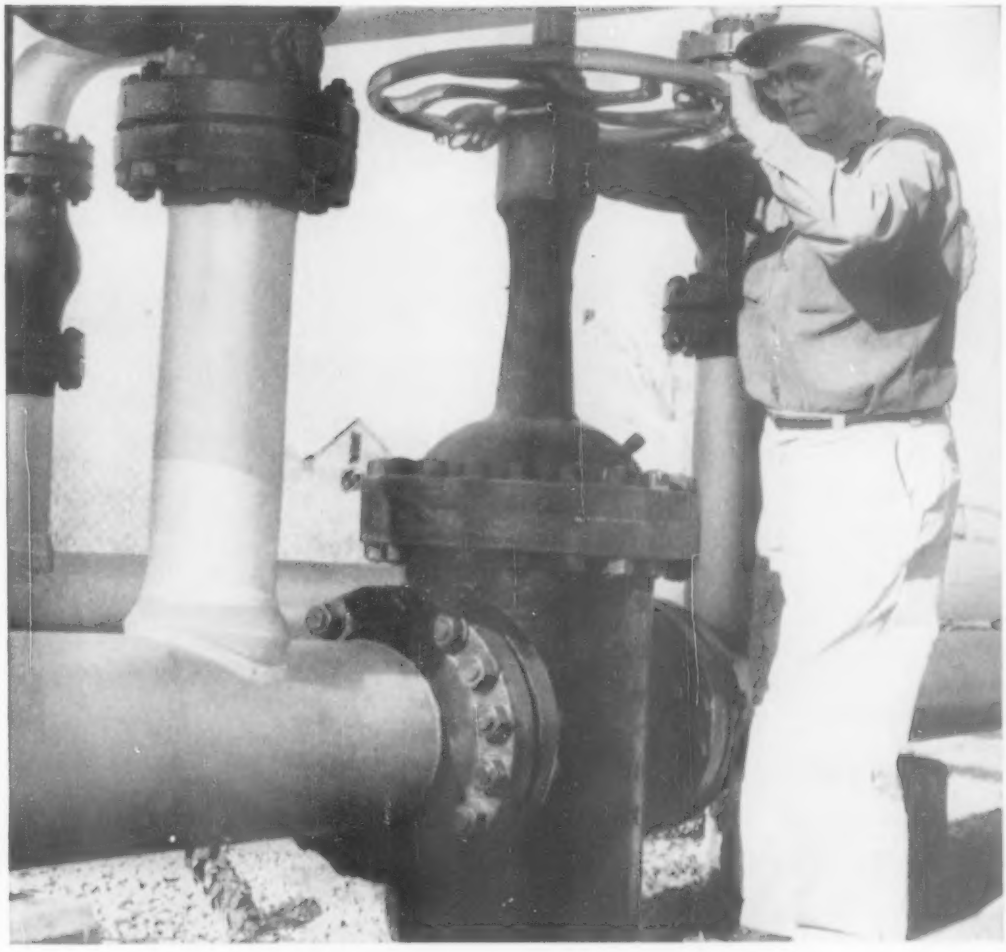
Israel-American, which was organized by Husky Oil Co. and the New York investment firm of Bear, Stearns & Co., is making prepartions for two other tests. One is scheduled in the Engedi license area near the Dead Sea where the company has been carrying on core drilling. Another deep test has been located near Petah Tikva, northwest of Tel Aviv. It was in this area that Israel-American several months ago obtained gas production in a core hole at a depth of several hundred feet. Structure drilling has been completed in this area as an aid to interpreting seismic profiles.

Plenty of testing . . . Lapidoth-Israel is continuing work in its Massada well near the Dead Sea.It has been taken to about 2,300 ft. The hole is being reamed to set 13-in. casing. Some gas and heavy oil shows were reported earlier. Lapidoth-Israel is reported preparing another location in the general area for a deep test to start in about 90 days.

(Continued on page 105)

Creole's New Home in Caracas

This 10-story structure is the new and permanent home of Creole Petroleum Corp. in Caracas, Venezuela. Of earthquakproof construction, it matches the modern architecture of other buildings in the neighborhood, the University City area. The building houses 1,400 employes. Among its many features are the executive offices, conference rooms, a library, an auditorium, and a kitchen.



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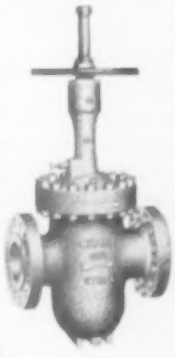

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Exploration licenses are held in Israel covering more than 2½ million acres, or about half the country's total land area. The licenses were granted under Israel's petroleum law enacted 2½ years ago. Besides the active drilling operations, considerable core drilling and geophysical work is under way in the country.

Other companies holding exploration licenses in Israel are Israel Oil Prospectors Corp., Ltd., representing Israeli, Swiss, and United States capital; D. C. Bintliff, Houston; and Nadel & Gussman, Tulsa, jointly with Palestine Economic Corp., New York. Bintliff is associated with Israel-American, and Israel Oil Prospectors with Lapidoth-Israel. This leaves the four active operators as Israel American-Pan Israel; Lapidoth; Israel-American; and Israel Continental-Pontiac.

Sui Linked to Karachi

Main construction job completed on 348-mile West Pakistan line; it's first big natural-gas pipeline in the Far East

THE main construction job has been completed on the Sui-Karachi gas pipeline in West Pakistan—the first long-distance natural-gas carrier in all Southeast Asia and the Far East.

The final joint on the 348-mile, 16-in. line was welded at the Karachi end in mid-April. Gas will start moving in the line in 3 or 4 months.

Only other important gas transmission systems in the Eastern Hemisphere are in southwestern France and northern Italy.

The project was carried out by Sui Gas Transmission Co., Ltd. This company is controlled by Pakistan investors, including the government's Industrial Development Corp. Remaining capital is held by the British Commonwealth Development Finance Co., Ltd., and Burmah Oil Co., Ltd. B.O.C., whose subsidiary, Pakistan Petroleum, Ltd., discovered the Sui gas field in 1952, has about 25 per cent interest and holds a long-term agreement to manage the pipeline.

Gas by August . . . Originally estimated cost of the line was the equivalent of $25,200,000. Of this, $14,000,000 was provided in a loan by the International Bank for Reconstruction and Development. Principal contractor was Pakistan Constructors, a firm organized for the job and owned 75 per cent by Morrison-Knudsen, Boise, Idaho, and William Press, Ltd., London.

Welding of the final joint of pipe was marked in a ceremony at Karachi. Among those attending were: A. T. Naqvi, chief commissioner, Karachi; F. B. Arnold, British trade commissioner in Pakistan; Viqar Ahmar, financial adviser to the Pakistan Government; Naseer A. Shaikh, director of the Pakistan Industrial Development Corp.; and M. J. Condon, general manager for B.O.C. in Pakistan.

It will be August before gas begins moving through the line to industrial consumers in Karachi and intermediate points. A British-Arab firm known as Mother Cat (owned jointly by Motherwell Bridge in England and Construction & Trading Co. of Beirut, Lebanon), is laying a system of distribution lines in Karachi, Hyderabab, and Khairpur.

An average of about 45 million cubic feet daily will be moved through the line during the first stage of operation. Estimates are that this will result in an annual saving to Pakistan of $7,400,000 in the cost of imported fuel. The first-stage volume of gas is equivalent to around 500,000 tons of coal, or 42 per cent of Pakistan's total annual requirements.

Laying the line took place under extremely difficult climatic conditions and was finished in 168 days, or just over 5½ months.

During one single day on the job, the contractors completed a total of 401 welds, claimed as a record of its kind in the pipelining industry. The line crossed five rivers as well as a number of canals. Sixteen hundred men worked continuously on the project, and at times as many as 5,000 workers were employed. The 42,000 tons of 16-in. pipe was supplied by Stewarts & Lloyds, London.

Studies wider use . . . The Pakistan Government already is considering even wider use of the Sui gas. It is studying a proposal to move gas north to Kot Adu where a large power plant would be built.

Pakistan Petroleum's Sui field in the Bugti Hills in southern Baluchistan is ranked as a major accumulation capable of producing nearly 100 million cubic feet for the next 100 years. As of late last year, there were six wells, four of which each have a maximum estimated producing capacity of 15 to 20 million cubic feet daily. Another well is expected to be used for observation.

Construction of a 17-mile gathering system in the field and a gas purification plant is being carried out by Hudson Engineering Co., Houston, as contractor.

The communications system for the pipeline includes a v.h.f. multichannel system providing speech and teleprinter channels; a v.h.f.-a.m., fixed-to-mobile network for maintenance; and a duplex H.P. radio-telephone or teleprinter system. Contract for the communications equipment is held by the British firm of Pye, Ltd., together with two other British companies, Etelco, Ltd., and Redifon, Ltd.

Another and smaller natural-gas pipeline project is under way in the northern part of West Pakistan by Attock Oil Co., Ltd., the British company which now produces most of Pakistan's domestic crude-oil output of about 4,500 bbl. daily. Attock Oil's 60-mile line will extend from Dhulian field to move the company's gas surplus to its refinery and other industrial consumers in Pawalpindi.

Expansion Revealed

Bahrain Petroleum to add more units at refinery

BAHRAIN PETROLEUM CO., LTD., is planning the most extensive refinery program to be undertaken in Bahrain during the past 10 years.

The company's plans were revealed in its 1954 report submitted recently to the shaikh of Bahrain. The construction, to be spread out over several years, will include a second large cat cracker and allied gas-recovery and rerunning facilities, a polymer plant, and two vacuum units.

Increased demand by world markets was given as the reason for expanding the refinery. "The long and continuing good relationship that has existed between the peoples of Bahrain and Bapco fully justifies the heavy capital investment necessary for the materials and labor involved," the report stated.

Bapco is one the Caltex group of 92 companies doing business in the Eastern Hemisphere. The group is owned by Standard Oil Co. of California and The Texas Co.

Refinery runs high . . . During 1954, crude-oil runs to Bapco's Bahrain refinery averaged 214,000 bbl. daily, an increase of about 7 per cent over 1953. The biggest share of the input was Saudi Arabian crude, which totaled 67,369,067 bbl. and was shipped in by pipeline. The refinery also handled domestic crude production, which last year totaled 10,779,181 bbl., or about 30,000 bbl. daily.

Fuel oil was the biggest single product of the refinery. Production totaled 29,730,456 bbl. Other products were gasoline, 19,627,614 bbl.; power kerosine, 2,062,873 bbl.; aviation turbine fuel 1,721,299 bbl.; kerosine, 4,587,175 bbl.; diesel oil, 13,838,870 bbl.; asphalt, 629,620 bbl.; and tapped crude, 1,372,673 bbl.

Crude output of Bahrain has remained at about the 30,000-bbl. daily level since mid-1948. Development work in 1954 aimed at maintaining this production. Fourteen first and second pay wells were completed as part of a long-range program which calls for from 10 to 12 wells a year.

Exploration slow . . . Because Bahrain's boundary question was unresolved, exploration last year was limited to undisputed territory. Over-water structure drilling was begun early this year in the Fasht Adhom area. Eight structure holes, including one onshore, were dusters.

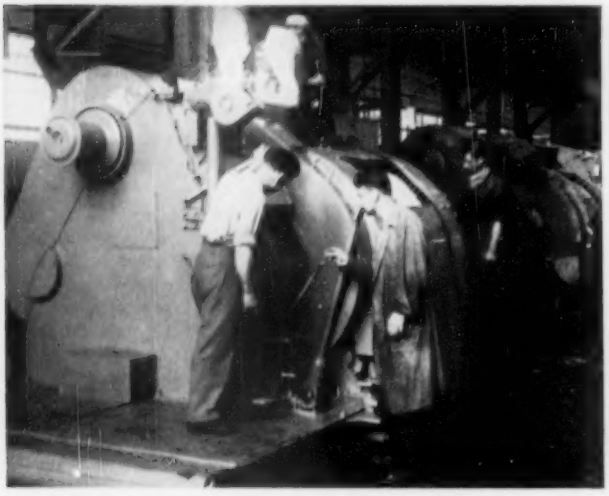
Out of a total of 8,532 employes on the Bapco payroll, only 42 are Americans. There are 5,829 Bahrains. The largest other groups of nationals are British, 1,002; Indians and Goanese, 612; Pakistanis, 132; and Australians, 44.

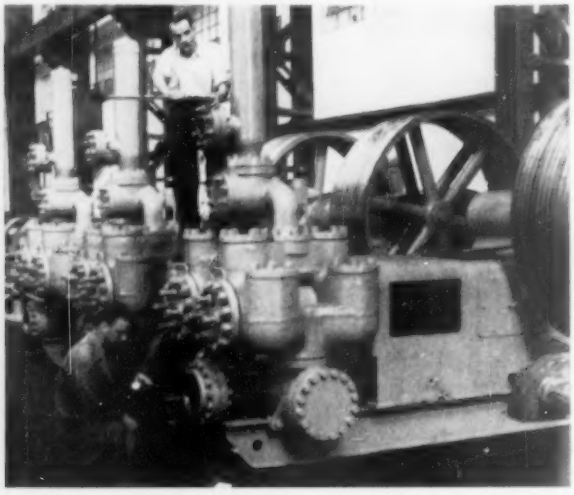
International Briefs

Standard-Vacuum Oil Co. has further decentralized its management by setting up five regional areas, each under a coordinator who will be responsible for company interests within his region. Coordinators will take care of many operating problems formerly handled by the board of directors. Their offices will be in New York. Three regional heads have been named. They are Harry A. Gibbon, Southeast Asia; James D. Jacobs, Australia-New Zealand; and Joseph A. Parrish, Far East.

D'Arcy Exploration Co., Ltd., is planning to begin surface work, initially a gravity survey, in the Cheshire basin, England, this summer. The program is a part of the 5-year exploration for natural gas which D'Arcy has undertaken in Britain on behalf of the British Gas Council.

A 4,300-bbl. daily Platforming unit has gone on stream at the refinery of Cia. Espanola de Petroleos at Tenerife, Canary Islands. It will be used to produce 80/86 octane gasoline which will be marketed in Spain, gradually replacing the best quality 70/72 octane now available. A Udex plant also has gone into operation at Tenerife. The refinery has a capacity of 40,000 bbl. of crude daily.





Reds Copy U. S. Equipment

Drilling equipment manufactured in Communist Romania apparently is little more than copies of American models. These pictures show equipment undergoing final tests at the Ploesti works, which supplies the Romanian oil industry. The heavy-duty draw works, left photo, appears to be a copy of equipment shipped to Romania from the United States in the late 1930's. The slush pump, right photo, evidently is duplex-power unit designed with a double-acting piston. The castings on the pump apparently are closed—a type given up several years ago by United States manufacturers. The Ploesti factory, called the "May 1 Works," may be the plant formerly known as Concordia, which was oil equipment manufacturing center prior to World War II.

World Standard of the Industry

HUGHES rock bits are recognized as the standard of the industry throughout the World because of their consistent, superior performance, year-after-year. Oil men know from experience that they can use the footage and drilling rate of Hughes bits—of any given type—as a yardstick for determining drilling gains and estimating drilling costs. To assure the continued improvement of its bits, Hughes is intensifying its extensive field and laboratory research program, now in its 45th year.

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Here's a new method of predicting . . .

Current Requirements for Cathodic Protection

. . . of well casing

by
Dr. Leendert de Witte

S.P. Currents and Casing Corrosion

THE general theory of the relation between S.P. currents and external casing corrosion was presented in a paper by de Witte and Radd.[1]

The main conclusions that can be drawn from that paper may be summarized as follows:

1. The larger part of corrosive casing currents, as detected by casing current profiles, are due to the spontaneous potentials which are normally recorded on electric logs.
2. Unprotected casing short-circuits these potentials. The effects of the many local S.P. cells at formation boundaries are superimposed on each other due to the high contrast in conductivity of the pipe and the surrounding formations.
3. It is possible by use of linear transform theory to calculate the approximate over-all current profile in the casing due to the superimposed effects of all the individual S.P. cells.
4. The calculated profile shows the major anodic and cathodic areas along the pipe.
5. The location of the calculated anodic areas agrees fairly well with that of casing leaks due to external corrosion.
6. Laboratory work has shown that in anaerobic systems appreciable hydrogen overpotentials develop, which are largest where current densities at the cathodic surfaces are largest. The overpotentials will have some tendency to smooth out the sharp detail of the casing current profiles and therefore make local anodic slopes on the profiles less abrupt.
7. The intensity of the casing current will be greater the larger the S.P. potentials measured in the open hole. By decreasing the contrast in salt concentration between the drilling mud and the connate waters, the magnitude of the casing currents will be decreased and therefore the requirements for cathodic protection current will be smaller.

The present paper discusses the S.P. surveys inside the casing; and the author considers in great detail the effects of hydrogen polarization potentials; examines the chances of cathodic protection against the combined effects of S.P. currents and galvanic cells, and outlines a method of calculating cathodic-protection current requirements.

THIS paper considers the interpretation of both open hole and inside casing spontaneous potentials surveys with regard to prediction and treatment of external casing corrosion.

- The combined effects of S.P. currents and local galvanic cells are studied. Some laboratory data are given on the effects of hydrogen polarization potentials.
- A method of predicting current requirements for cathodic protection is described.
- Both theoretical derivations and iron loss calculations show that 5 amp. of cathodic protection is totally insufficient for deep wells in California.
- Tentative alternative methods to alleviate the corrosion in such wells are described.

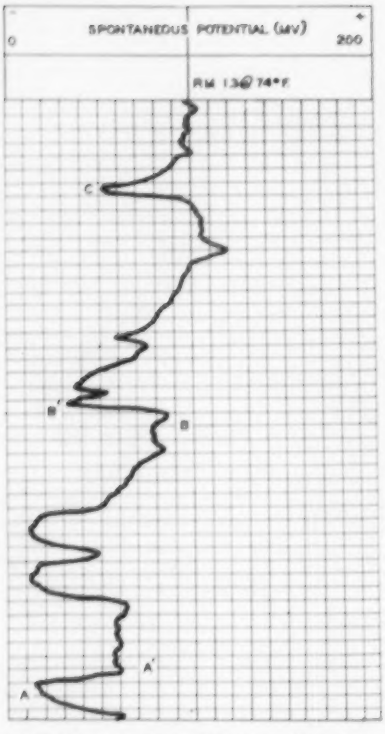
- External casing corrosion is largely due to the combination of S.P. currents and galvanic action.
- Leaks will occur earliest where the anodes of both these mechanisms coincide.
- Corrosive attack predicted by evaluating the above two mechanisms agrees both as to location and magnitude with observed corrosion damage.
- Five amperes of cathodic protection current is *not sufficient* to protect the deep wells under corrosive conditions such as occur in the fields in Ventura County, California. Checking of the average corrosion rate during the first 5 years of these wells would require 20 to 30 times as much current.

S.P. surveys inside casing . . . Immediately after casing is set but while the hole is still filled with drilling mud, it is possible to run inside the casing an S.P. log similar to the open-hole electric-log S.P. survey. Where intermediate strings of pipe are set or where more hole is drilled below the casing shoe, these S.P. surveys can be made cheaply at the time the electric log is run in the open hole below the casing. The only precaution necessary is that insulating centralizers be placed on the logging sonde to prevent the S.P. electrode from rubbing against the casing.

The in-casing S.P. is a measure of the potential distribution in the mud along the axis of the mud-filled casing and is therefore an indication of e.m.f.'s acting upon the casing and of ohmic potential drops along the casing.*

Fig. 1 shows a typical example of an in-casing S.P. log (new casing in a well in Ventura County, California). Notice the number of abrupt changes in potential, many of a magnitude of 50 mv. or more. Let us consider some of these changes in detail: At AA' we have an

*The use of inside-casing S.P. surveys for the investigation of corrosive mechanisms was suggested to the author by A. J. de Witte, of Continental Oil Co.



TYPICAL S. P. LOG taken in casing of well in Ventura County, California. Fig. 1.

almost linear increase in potential of 45 mv. extending over a distance of approximately 7 ft.; at BB′ we notice a decrease of 52 mv. spread out over about 5 ft. The linear change in the potential curve indicates a practically constant amount of current in the mud over these intervals which appears and disappears very sharply at the abrupt end points.

From the slope of the potential curves, we can easily deduce the strength of the currents. The mud resistivity was 1.3 ohm-meter at 74° F. = 0.85 at 120° F.; this means a resistance of 13 ohms per foot of mud column inside the 7-in. casing. The current between A and A′ is therefore:

$$\frac{45 \times 10^{-3}}{7 \times 13} = 0.5 \times 10^{-3} \text{ amp.}$$

= 0.5 ma. and between B and B′ we have:

$$\frac{52 \times 10^{-3}}{5 \times 13} = 0.8 \text{ ma. of current.}$$

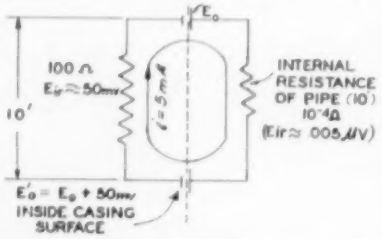
These currents are due to local galvanic cells caused either by changes in metal composition of the casing (bimetallism) or by differences in the surface layers of the steel pipe (mill scale, oxide layers, bare metals, etc.)

At point A′ we see positive current abruptly entering the mud (leaving the pipe). The current entry at point B′ is much sharper yet and it may be confined to 2 in. or less of casing length or a total surface area of not more than 50 sq. cm. The current density at these anodic spots on the pipe is therefore of the order of 10^{-5} amp. per sq. cm.

Point C is an example of a cathodic area of very limited extent which is strongly cathodic relative to the casing surface both above and below this point.

The potential changes in the mud represent the external IR drops of the galvanic cell circuits. Since the resistance of the mud column is very much larger than that of the casing, the external ohmic drop will also be much larger than the internal voltage drop. The potential change measured in the mud will be close to the total e.m.f. of the galvanic cells (except possibly for cases where ohmic losses in resistive surface layers on the pipe are appreciable).

The resistance per foot of 7-in., 23-lb. pipe is approximately 10^{-5} ohm. The internal voltage drop in the pipe due to the current of AA′ will therefore be approximately equal to 3.5×10^{-8} volts or 0.035 μv. These voltage drops are well below the limit of accuracy of the casing current profiles measured with steel contact electrodes and will therefore not be noticeable on these profiles.



EQUIVALENT CIRCUIT of galvanic cells at inside casing surface. Fig. 2.

Fig. 2 shows an equivalent circuit of a typical galvanic cell as analyzed above indicating the orders of magnitude of the resistances and ohmic voltage drops.

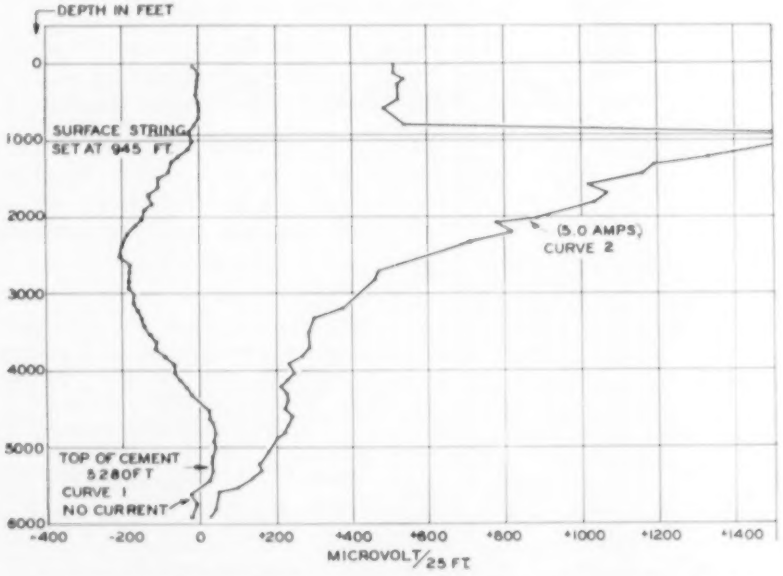
It is clear that the casing current profiles will not correlate with the rapid potential changes as measured on the S.P. surveys inside casing.

The question arises whether the currents in the casing caused by the spontaneous potentials between the mud in the drill-hole annulus and the formation waters and the cathodic-protection currents applied to counteract the damaging effects of these S.P. currents have a noticeable influence on the potentials measured in the mud inside the casing.

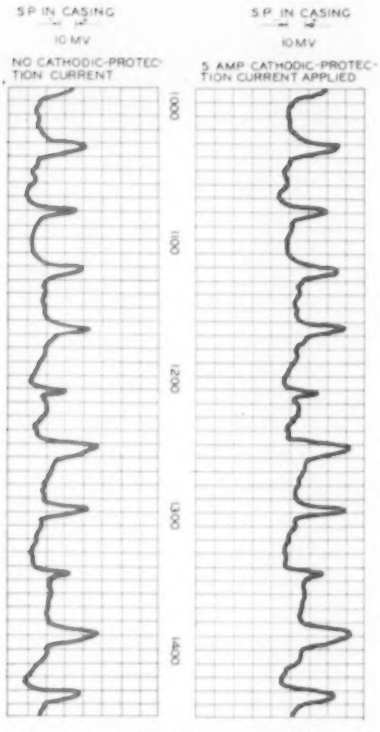
Fig. 3 shows a casing-current profile made in old casing prior to repairs. Curve 1 shows the natural casing currents, while Curve 2 is a profile with 5 amp. of cathodic-protection current applied.

With the cathodic protection applied, the current strength at 4,500 ft. is approximately $\frac{200 \times 10^{-6}}{25 \times 10^{-5}} = 0.8$ amp. This means a voltage drop of 0.8 mv. per 100 ft. or 8 mv. in 1,000 ft. The only effect of cathodic-protection current on S.P. logs inside casing is therefore shown to consist of a slow drift of the baseline (to the positive side with increasing depth).

Fig. 4 shows S.P. curves inside casing with and without cathodic-protec-



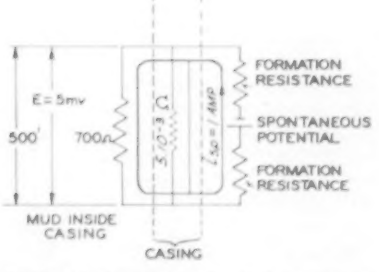
CASING CURRENT PROFILES taken with and without cathodic protection. Fig. 3.



S. P. LOGS taken inside casing before and after application of cathodic protection. Fig. 4.

tion current applied. On the left-hand curve, we note that there is no potential difference between the points at 1,000 ft. and at 1,410 ft. On the right-hand curve, the point at 1,000 ft. is approximately 12 mv. more negative than the point at 1,410 ft. This corresponds to approximately 3 amp. of cathodic-protection current flowing in the pipe through this interval.

The spontaneous casing currents caused by the self-potentials between the mud and formation waters will similarly result in small base line shifts of the S.P. logs inside casing. Fig. 5 shows an approximate equivalent circuit for casing currents in the mud column caused by the external spontaneous potentials with typical values of resistances and voltage drops indicated.



EQUIVALENT CIRCUIT of S. P. currents in casing and mud column. Fig. 5.

The regularly spaced potential kicks in Fig. 4 are due to galvanic cells at the casing collars which probably find their origin in the different surface condition of the steel at the collars as compared with the remainder of the pipe. In these cells the collar is usually anodic relative to the remainder of the pipe. As the surface layers are removed by this galvanic cell action, the strength of these cells diminishes rapidly.

In contemplating the surveys presented in Fig. 4, the reader may wonder why the cathodic-protection current in the case of the log at the right-hand side seems to have no effect whatsoever on the local galvanic cells. This is readily explained by the fact that the cathodic protection is applied only to the outside surface of the pipe while the curves of Fig. 4 register the galvanic effects at its inside surface. As soon as the mud inside the pipe is removed, these inside effects will completely disappear (except in possible situations where a thin film of water still coats the inside surface of the pipe, in which cases the magnitude of the currents will still be drastically cut down due to the greatly increased resistance of the circuits).

External galvanic cells . . . Studying the galvanic effects inside the casing is important because almost identical cells exist where the outside surface of the pipe is in contact with mud in the annulus between casing and boreface.

For the case of 7-in. casing in a 10-in. hole, the ohmic resistance per foot of the mud in the annulus will be almost the same as that of the mud column inside the pipe (16 ohms for mud of 1 ohm-meter resistivity). We must, however, take account of the conductivity of the formation. The problem of finding the external resistance between two points on the casing is analogous to that of finding the response of the monoelectrode resistivity log.

The resistance between the anode and cathode can actually be found by superposition of the potential fields of a positive and a negative single electrode and dividing the sum of the absolute values of the potentials at the electrode surfaces by the total current. The potentials in questions can be determined using the departure-curve equations for the normal logging device while taking the spacing equal to the equivalent electrode radius.[2]

For the case of 7-in. pipe in a 10-in. hole with a mud resistivity of 1 ohm-meter and a formation resistivity of 5 ohm-meters, we find, for an anode-to-cathode separation of 5 ft., an external resistance of approximately 6 ohms. For electrode separations of 2 and 10 ft., we find external resistances of respectively 5 and 6.3 ohms (all these resistances are calculated for electrode lengths approximately equal to the casing diameter). For the same electrode configuration inside the pipe and the same mud resistivity, the resistances in the mud would be 32, 80, and 160 ohms respectively for electrode separations of 2, 5, and 10 ft.

Ten times as much current . . . For electrode separations of the order of 5 ft., which to judge from Figs. 1 and 4 appear to be typical, **the external resistances in the galvanic cells at the outside surface of the pipe are roughly 10 times as small as those for the cells measured inside the pipe.**

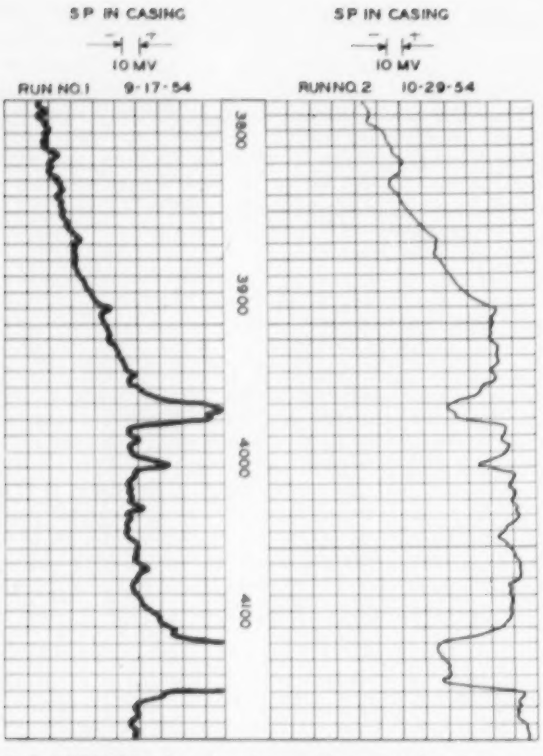
Since the external resistance is the main factor in determining the current strength, the currents in the outside galvanic cells should be expected to be roughly 10 times as large as those calculated for the inside cells. This gives current strengths of the order of 5 ma. and corresponding current densities at the anode areas of 10^{-4} amp. per sq. cm.

The galvanic cells caused by the action of thin surface layers (oxides, mill scale) will usually disappear gradually as the layers at the anodic areas are removed. In some instances the removal of an outer surface layer that was anodic with respect to neighboring sections may expose the bare metal surface which may be either neutral, anodic, or cathodic to its surroundings. If the latter is true, the polarity of the cells will reverse. An example of this is shown in Fig. 6 in which an S.P. survey in a new casing is compared with a survey run 6 weeks later. We note that the direction of current flow in the cells at 3,965-80, 4,000-10, and 4,120-50 ft. has completely reversed. The exact types of electrode reactions taking place during these changeovers are not known.

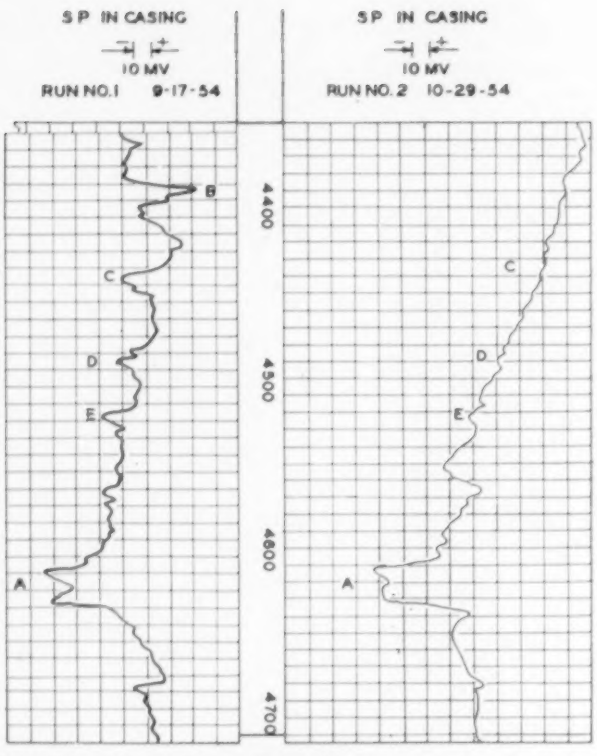
Fig. 7 shows another section of the same two surveys illustrating a case where a cell retains the same polarity and has increased in intensity (at 4,610-35 ft.) and several cases of cells that

THE AUTHOR

Dr. Leendert de Witte is a petroleum consultant at Laguna Beach, Calif., specializing in exploration, well surveying, production, and operations analyses. Prior to opening his consulting office, he was with Continental Oil Co. in petroleum-production research. He received his doctorate from California Institute of Technology in geophysics and petroleum geology.



S. P. SURVEYS taken 6 weeks apart in new casing shows complete reversal of galvanic cell polarity. Fig. 6.



ANOTHER S.P. LOG shows cell that did not reverse, A, and cells that decreased in strength, B, C, D, and E. Fig. 7.

have disappeared completely (4,385, 4,435, 4,485, and 4,518 ft.). The cell at 4,610-35 ft. which maintained its polarity was identified as a section of pipe which came from a different batch from most of the remainder of the pipe string.

Experimental Studies on Hydrogen Polarization Potentials

We say that at the cathodic areas positive current enters the pipe. Actually of course negative current in the form of electrons leaves the steel. The electrons interact with the cations in the electrolytic solution. One of two things happen, depending on the reduction potentials of the cations that carried the positive current in the electrolyte. Either the cations are reduced or the water in the vicinity of the cathode hydrolizes under formation of atomic hydrogen and hydroxyl groups. In the common case, where most of the cations are sodium ions, atomic hydrogen and NaOH are formed at the cathode.

The hydrogen atoms can exist in several phases which are in thermodynamic equilibrium before combining to form hydrogen molecules. The predominant phases are hydrogen atoms solvated by water molecules and hydrogen atoms absorbed on the metal. The equilibrium between these phases depends on the rate at which hydrogen atoms are formed near the cathode which in turn is determined by the current density. Depending upon the concentrations of the hydrogen atoms in these various phases, concentration overpotentials of varying magnitudes will exist between the cathode and the bulk of the solution. These potentials are commonly referred to as hydrogen overpotentials.

It can be shown both theoretically[3] and experimentally that at very low current densities the hydrogen overpotentials are proportional to the current density. With increase in current density, the overvoltage becomes proportional to the logarithm of current density. As current increases still further, the point is finally reached where gaseous hydrogen starts evolving at the electrode and from there on the overpotential remains constant.

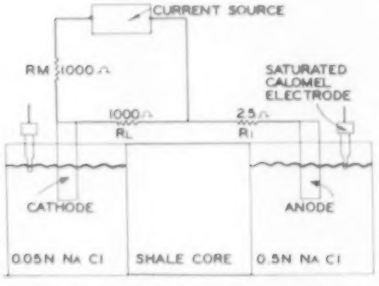
In the range where overvoltage is proportional to the current density, ($i \leq 2 \times 10^{-5}$ amp. per sq. cm.), the hydrogen overpotential can be treated as an added resistance in the circuit. This is true since voltage drop across a resistance is also proportional to the current. **The magnitude of this apparent resistance of the overpotential as compared to the sum of the external and internal resistances of the corrosion cells is the determining factor in the effect of hydrogen polarization on electrolyte corrosion in anaerobic environments.**

With oxygen present . . . If the environment is not completely anaerobic but contains some oxygen, then a minimum current density must be reached before hydrogen overpotentials start building up. This minimum current density is the point where the diffusion rate of oxygen to the cathodic area is just sufficient to remove the atomic hydrogen as it is formed. The general effect of oxygen and of other depolarizing agents will be to lower the polarization potentials.

Laboratory . . . Approximate values of the proportionality constant between current density and hydrogen overpotential have been determined in the laboratory. The experimental equipment used consisted of a cell comprising two NaCl solutions of different concentrations (0.05 n and 0.5 n respectively) separated by a shale barrier.

In each solution an electrode of casing steel was inserted and the electrodes were connected through a standard resistor. The S.P. voltage across the shale barrier was of the order of 50 mv. and caused sustained current flow through the electrodes. The exposed electrode area was selected so that current densities in this cell compared in magnitude to those found in outside casing corrosion under field conditions.

To study the variations on overpotentials with current density, an outside current source was connected so as to reinforce current flow caused by the S.P. cell. A schematic circuit of this arrangement is shown in Fig. 8. The



SCHEMATIC of circuit used in studying effect of current density on overpotential in an anaerobic system. Fig. 8.

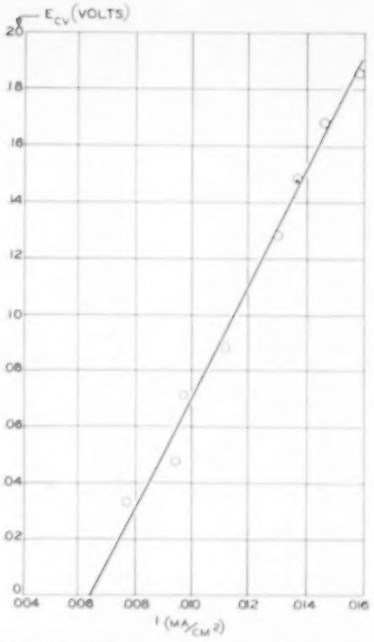
current through the cell was found by a measurement across a standard resistor (R_i) and the current density on the cathode surface determined by dividing through the electrode area.

The overvoltage was calculated by subtracting the product of current i and total ohmic resistance R_t from the total e.m.f. (S.P. + outside e.m.f.) impressed on the cell. A check on the overpotential was made by measuring the potential differences between the casing steel electrodes and the bulk of the solutions with standard saturated calomel electrodes. These latter measurements showed that all overpotential changes with increase in current occurred at the cathode. The potential of the anode with respect to the bulk of the 0.5 n solution remained essentially constant.

Oxygen removal . . . The system was made relatively anaerobic by first deaerating the solutions and then scrubbing them with a dispersed stream of oxygen-free nitrogen (the nitrogen was scrubbed in a column of copper shavings through which ammonia was circulated). Finally, to remove further traces of oxygen which might have been absorbed on the shale sample or the cell walls, several grams of sodium hydrosulfide ($Na\,H\,SO_3$) were added to the solutions.

Fig. 9 shows a plot of hydrogen overvoltage (E_{cv}) against current density obtained in one of these experiments. Note there is a fairly good linear relation between the two parameters. The fact that the line does not go through the origin indicates a finite current density before the overpotential starts building up. This means that in spite of precautions some oxygen was present in the system.

From the value of the limiting current density, the dissolved oxygen concentration was calculated to be approximately 0.48 p.p.m. The slope of the line in Fig. 9 shows an equivalent resistance of approximately 20,000 ohms per sq. cm. of cathode area.



RELATION between hydrogen overpotential and current density. Fig. 9.

In a later experiment the oxygen concentration was reduced to 0.12 p.p.m. and an equivalent resistance of 28,000 ohms per sq. cm. was found. The hydrogen overvoltages are considerably affected by the surface condition of the metal. The laboratory values for the equivalent resistances can therefore only be taken as indicating their general order of magnitude. For calculations on the effects of hydrogen polarization on casing corrosion currents, an average value of 25,000 ohms per sq. cm. will be used for the equivalent overvoltage resistance. For systems that are not completely free of depolarizers and for high current densities the equivalent overvoltage resistance is smaller.

Effect of Hydrogen Polarization on Casing Currents

The effects of hydrogen overpotentials on casing currents will be treated for galvanic-cell currents and for currents caused by earth potentials.

As shown in one of the previous sections, typical values for current in galvanic cells at the outside of the casing are of the order of 5 ma. And external resistances are of the order of 5 ohms while the internal resistance is negligible.

If we now consider one of these currents terminating on a 1-ft. section of pipe,* we have a total cathode area of 1,700 sq. cm. This corresponds to an equivalent polarization resistance of $\frac{25{,}000}{1{,}700} = 15$ ohms. We see that when the oxygen in the mud is exhausted and the system becomes anaerobic the total resistance in the circuit increases from 5 to 20 ohms which will cause the current to be reduced by a factor of four to give 1.2 ma. If the terminating and originating surfaces extend only over one-half of the 1-ft. section, the resistance is increased by 30 ohms and the corrosion current becomes roughly 0.7 ma. per ½ ft. of pipe. For the stronger galvanic cells, we may have two or three times as much current which results in values of 3 ma. per foot and 1.8 ma. per ½ ft. respectively.

If depolarizing agents such as sulfate-reducing bacteria are present, the hydrogen may be consumed as fast as it is formed and no hydrogen polarization takes place. The corrosion currents due to the galvanic cells remain then at their original strength of 5-10 ma. per foot.

Polarization Effects on S.P. Currents

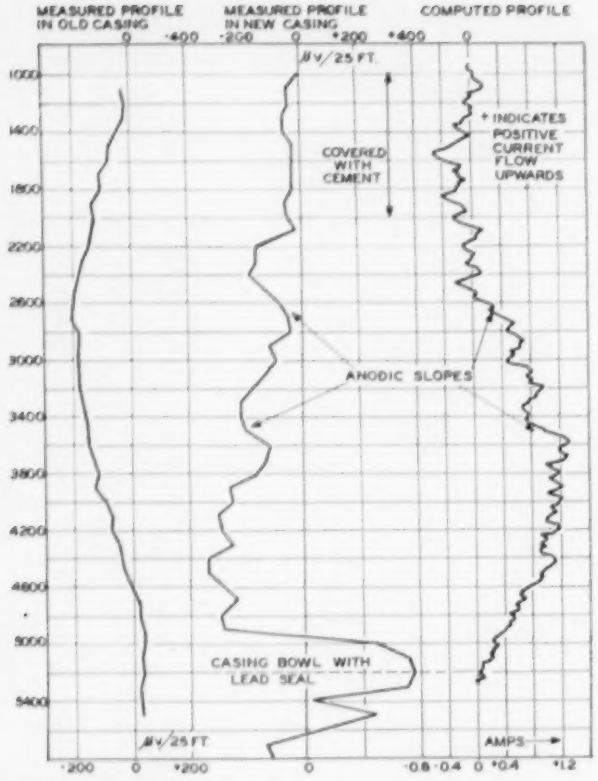
In order to evaluate the effects of hydrogen polarization on the currents caused by formation potentials, we must first obtain an estimate of the external resistances encountered by these currents in the borehole annulus and the formations.

A typical distribution of anodic and cathodic areas caused by S.P. currents in the absence of polarization is shown by the right-hand curve of Fig. 10, which is taken from the article by de Witte and Radd. We note that the majority of the anodes and cathodes exhibit fairly linear increases or decreases of current in the pipe except for the relatively abrupt end zones.

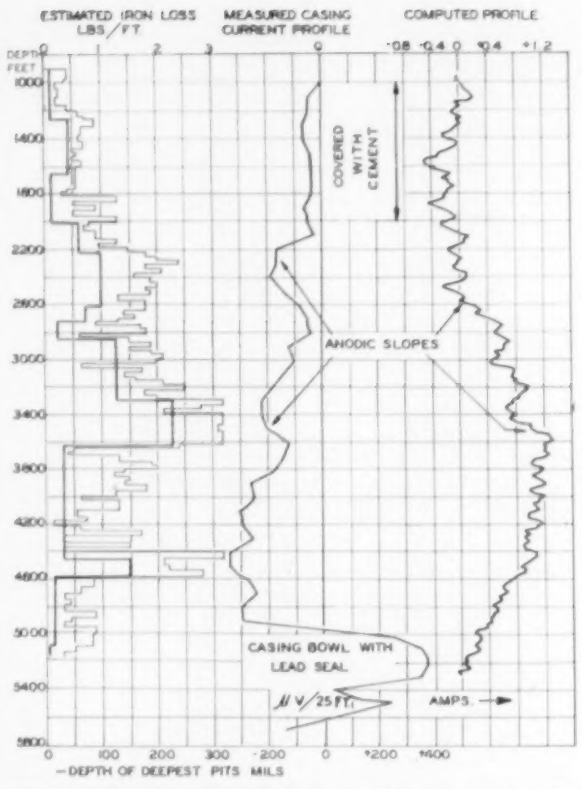
This indicates that the current densities entering or leaving the pipe may as a first approximation be taken as constant for each zone except near the ends. The external resistance of a system of this type is very similar to that of a guard electrode logging device. A quantitative evaluation of the electrode resistance for such devices was given by Buckner,[4] who derived the following equation by approximating the electrode surface by a prolate spheroid:

$$r = \frac{R_m}{4\pi k} \ln \frac{c_1 + k}{a_1} - \ln \frac{c_2 + k}{a_2} + \frac{R_i}{4\pi k} \ln \frac{c_2 + k}{a_2}$$

*From the inside-casing S.P. surveys points of origin and termination of the galvanic cell currents appear to be quite abrupt and often fall within 1 ft.



MEASURED AND COMPUTED casing current profiles. Note correlation of the curves in the anodic slope regions. Fig. 10.



PLOT showing observed iron loss, measured casing current profile, and computed casing current profile. Fig. 12.

where:

$k = (c_1^2 - a_1^2)^{1/2}$

r = electrode resistance (ohms)

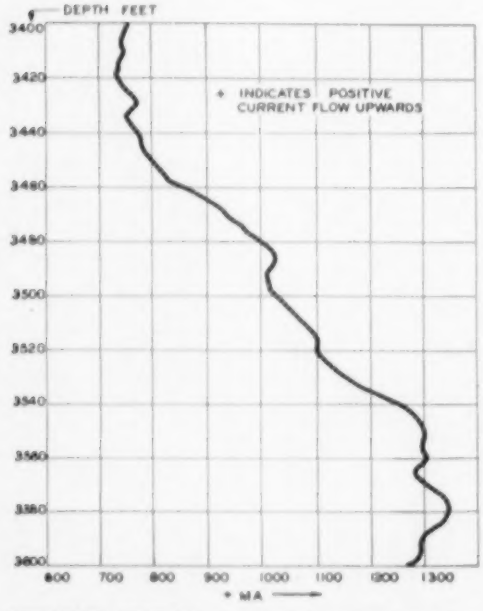
R_m = mud resistivity (ohm-meter)

R_t = formation resistivity (ohm-meter)

a_1 = radius of pipe (m)

a_2 = radius of hole (m)

c_1 = length of electrode under consideration (m)



DETAILED SECTION of computed casing current profile. Fig. 11.

c_2 is found from the following relation:

$$c_2^2 = c_1^2 + \lambda$$

with $\lambda = a_2^2 - a_1^2$

For the case of a 7-in. pipe in a 10-in. hole with R_m = 1 ohm-meter and R_t = 5 ohm-meters, we find resistances of 0.51, 0.15, and 0.08 ohm respectively corresponding to electrode lengths of 10, 50, and 100 ft. The total external resistance between anodes and cathodes of equal lengths will be close to twice these amounts or 1 ohm, 0.3 ohm, and 0.16 ohm respectively.

The equivalent polarization resistances for cathode lengths of 10, 50, and 100 ft. are respectively 1.5, 0.3, and 0.15 ohm. We note, therefore, that hydrogen polarization in an anaerobic environment will increase the total resistance by a factor of about 2 and decrease the current strengths by a factor of 2. For a cathode length of 10 ft., the reduction is a factor of 2.5 and for smaller cathode lengths will be still larger.

The polarization will, therefore, have a slight tendency to smooth out small irregularities in the S.P. current distribution. But most of the detail visible in Fig. 10 will be preserved, except for an over-all reduction by a factor of 2 in magnitude of the currents.

If the current entering or leaving the pipe is unequally distributed around the periphery of the pipe, both the ohmic electrode resistances and the equivalent polarization resistances will be increased in about the same proportion, so that the above conclusions remain valid.

Magnitude of Combined Casing Currents and Corresponding Iron Loss

The steep anodic slopes shown on the computed profile in Fig. 10 occurring between 3,400 and 3,600 ft. and the three successive slopes between 2,450 and 2,750 ft. correspond to current densities of 0.3 amp. per 50 ft. or 6 ma. per foot (positive current leaving the pipe). The measured slope in the new

casing, between 3,500 and 3,600 ft., indicates a change of 80 μv. per 25 ft. This corresponds to 0.32 amp. per 100 ft. or approximately 3 ma. per foot. The smaller value of the measured slope can be explained readily by the fairly strong averaging effect inherent in the method by which the measurements are made. As a matter of fact if we average the current loss between 3,600 and 3,500 ft. on the computed profile, we find a value of 0.24 amp. per 100 ft.

After depletion of the oxygen in the mud, hydrogen polarization will decrease the current density to approximately 3 ma. per foot.

Fig. 11 shows a detailed plot of the computed profile between 3,400 and 3,600 ft. The steepest anodic slope occurring between 3,460 and 3,480 ft. corresponds to a current density of 150 ma. per 20 ft. or 7.5 ma. per foot. In an anaerobic environment, without depolarizing agents present this would reduce to approximately 3.75 ma. per foot.

In order to relate the current densities to iron loss, we use the following calculation:

1 ma. = 10^{-3} coulombs per second = 86.4 coulombs per day = 31,500 coulombs per year = 0.326 faraday per year = 9.1 g. per year = 0.02 lb. per year.

In the conversion from faradays to grams, it is assumed that the iron goes into solution as ferrous ions (1 g. equivalent = 28 g.). We can now make the following table:

TABLE 1—CALCULATED IRON LOSS

Subsurface environment—	Galvanic cell current density (ma./ft.)	S.P. current density (ma./ft.)	Total current density (positive superposition)	Iron loss (lb./ft./yr.)	Well No. A calculated Iron loss, 5.7 yr. (lb./ft.)
Anaerobic	1-3	3	4-6	0.08-0.12	0.46-0.7
Aerobic	5-10	6	11-16	0.22-0.32	1.25-1.8

The last column of the table gives the expected iron loss for the casing of a well in Ventura County, California, designated as Well A, the casing of which was in place for 5 years and 8 months before being pulled. The figures given correspond to the places where the anodes of the galvanic cells are superimposed on the anodic slopes due to S.P. currents.

Fig. 12 shows observed iron loss for the casing of the same well plotted versus depth. These data were obtained from Dr. J. D. Sudbury, of Continental Oil Co., who had derived them from depth measurements of pitting and estimates of areal extent of corroded spots. Although these estimates are rough and may be in error by as much as 50 per cent or more, we find a good agreement in order of magnitude of the calculated and observed iron-loss figures.

Another estimate of iron loss was obtained by J. D. Lung of Continental Oil Co. on a joint (from 2,662-92 ft.) by calipering and weighing 10-ft. sections after removal of mud and cement in a furnace. Lung's measurements gave values of 0.5 to 0.6 lb. per foot.

Comparison of the observed values with the last column of Table 1 leads us to believe that in various places depolarizing agents must have been present and corrosion progressed at a rate comparable to what would be expected under aerobic conditions. In the Ventura County fields the presence of sulfate-reducing bacteria probably accounts for the depolarization phenomena.

Corrosion Rates, Iron Loss, and Cathodic Protection

In the work by Sudbury, Landers, and Shock,[5] all conclusions regarding cathodic protection current requirements are based on the studies of measured casing current profiles in old casings such as shown on the left-hand side of Fig. 10. These profiles show general anodic slopes extending over a large part of the casing.

In the case of the well studied in Fig. 10 the casing was largely covered by cement down to 2,000 ft. and the oil-string cement top was at 5,280 ft. The anodic slope on the measured profile occurred between 4,700 and 2,500 ft. and covered, therefore, 2,200 out of the 3,280 ft. or two-thirds of the unprotected casing.

From the fact that most of the severe corrosion occurs in the interval covered by the anodic slope, it is surmised that the measured survey realistically represents the essence of the corrosive attack. On the strength of this assumption and the fact that 5 amp. of cathodic protection is sufficient to remove the anodic slope, it is then concluded that 5 amp. of current is sufficient to stop the corrosion in progress on the casing.

A comparison of the left-hand survey in Fig. 10 and the iron loss and depth of pitting data in Fig. 12 shows no detailed correlation between the severity of corrosive attack and the slope of the profile. Specifically there is no characteristic of the profile in the old casing that explains the very severe attack in the intervals of 3,400-3,600 and 4,400-4,600 ft. or the relatively severe corrosion between 2,200 and 2,500 ft.

Note that even qualitatively the correlation between the measured profile in the old casing and the location and severity of the corrosive attack is rather poor.

How much iron loss? . . . Let us now examine the quantitative aspects of the problem. The anodic slope at the left-hand side of Fig. 10 corresponds roughly to a change of 150 units (μv. per 25 ft.) per 1,000 ft. This is approximately equivalent to a loss of 0.6 amp. per 1,000 ft. or 0.6 ma. per foot.

According to the derivation shown earlier, this corresponds to an iron loss of 0.012 lb. per foot per year or 0.07 lb. per foot over the period of 5 years and 8 months during which the casing was exposed. **The estimated iron loss in the areas of the most severe corrosive attack is more than 30 times as large.**

The fact that 5 amp. of cathodic protection is just able to remove the observed anodic slope has, therefore, no quantitative bearing whatsoever on the question of what is needed to protect the casings from corrosive attack. Consequently the conclusion that an applied current of 5 amp. should be sufficient to protect the well in question would be without any realistic basis.

The inconsistency of the claims that 5 amp. or less are sufficient to prevent corrosion in deep wells comes to light clearly when we consider the problem at the base of the surface pipe. At this point approximately three-fourths of the total protection current leaves the oil string over an interval of 40 ft. It is estimated that this condition is not severe enough to cause leaks within the first 5 years of application of the cathodic current. The condition is equivalent to that which would exist if all of the current left the pipe over an interval of 52 ft. It is implied therefore that a current which is insufficient to cause leaks in a period of 5 years when leaving the pipe over an interval of 52 ft. is on the other hand sufficient to protect 5,200 ft. of pipe from leaks, which without this protection do occur after a 5-year period.

Scale formation at cathode . . . Only one argument has came to the author's attention against the above calculations and demonstrations. That consists of the claim that cathodic-protection current causes the deposition of carbonate scale on the cathodic areas. This increases the resistance to the corrosion currents and, therefore, quickly relieves the corrosive conditions to the extent that 5 amp. of current becomes enough to stop corrosion.

This argument does not account for an important fact. For every anodic slope caused by natural corrosion currents there is an equally strong cathodic

SIMPLE METROD OF CALCULATING THE MAGNITUDE OF CATHODIC PROTECTION CURRENT REQUIREMENTS

It is observed that the combined effects of S.P. currents and galvanic cell action correctly represent the magnitude of corrosive attack in many areas. From this observation it is possible to derive a rapid method of obtaining a first approximation to the current requirements for cathodic protection against external casing corrosion.

Fig. 12 shows the sections where leaks have developed (deepest pits 330 mils) have an average iron loss of more than 2 lb. per foot. This is equal to about 10 per cent of the original casing weight, which was 23 lb. per foot.

If we assume that this percentage iron loss at places where leaks have developed holds true in general as a first approximation, and we make use of the fact that 1 ma. of current is equivalent to 0.02 lb. of iron loss per year we find the following relation for the cathodic protection current requirements:

$$I = 5C \frac{LW}{T}$$

Here:

I = minimum required cathodic protection current (amperes)

L = average depth in thousands of feet to top of oil string cement in the field in question

W = casing weight (lb. per foot)

T = average time before leaks develop, after setting of the casing (years)

C is a weighting factor, which takes account of the fact that the amount of cathodic protection current leaving the pipe per unit length diminishes with depth.

Typical values of C for various depths to the deepest leaks occurring in the field are given in Table 2:

TABLE 2—VALUES OF C

Depth of deepest leaks (ft.)	1,500	2,500	3,500	4,500	5,500
C	0.9	1.1	1.7	3.0	5.0

Where actual iron loss data are available a more rigorous estimate can be made.

In new fields calculations from the open hole S.P. as described by de Witte and Radd[1] plus inside casing S.P. studies may help to evaluate protection requirements.

In each individual case the above methods will serve to indicate whether or not external casing corrosion control by cathodic protection alone, is economically feasible.

slope with current densities 20 to 30 times as large as those due to the cathodic protection current. If these much larger current densities failed to sufficiently coat the cathodic areas with resistive scale, it is difficult to see why the applied current would do this to any appreciable extent.

It may be possible that with time the severity of corrosive attack decreases. To date this assumption consists, however, mostly of conjecture. The data presented in Table 1 are based on calculations made from corrosive mechanisms observed just after casing is set. The average iron loss over 5 years appears to be even somewhat larger than the calculated values. This does not give too much hope that with time the corrosion rates decrease to the point where 5 amp. of current can stop further iron loss.

Possible Methods of Alleviating External Casing Corrosion

The most obvious means to protect casing from external corrosion would appear to be an insulating coating. Certain types of bituminous coatings are said to be reaching the point where they will stand oil well conditions. If coatings are damaged during lowering of the pipe, a small amount of cathodic protection will create a high enough current density at the holes in the coating to prevent corrosion at these points. This is one of the most common means of protecting pipelines.

If no satisfactory coating can be found in short order, there are several steps that can be taken to alleviate the corrosive conditions for new wells. First of all, conditioning the mud just prior to setting casing in such a way that the mud resistivity will equal the average resistivity of the formation waters for the interval between the surface pipe and the calculated cement top, will remove the spontaneous potentials. This will stop corrosion due to S.P. currents. In the usual case where formation waters are more saline than the mud, this is done by adding salt to the mud.

Secondly, careful selection of the pipe in the casing string will help to moderate the galvanic cell corrosion. The string should be made up such that all joints between the surface pipe and calculated cement top are from the same batch and in the same condition. Odd joints and sections should be placed either well below the calculated cement top or in the part protected by the surface pipe.

After these steps are taken, strong cathodic protection may be sufficient to remove any residual corrosive action.

For old wells a careful evaluation should be made of the economics of the strongest possible cathodic protection. The largest currents economically feasible should be selected. Periodic checks should be made to see whether corrosion has been stopped and whether less current might be used. To this latter end, the development of an outside casing corrosion detector should be of great help. Also an immediate solution to the current problem at the base of the surface pipe should be sought.

Acknowledgments

It gives the author pleasure to acknowledge the help of A. J. de Witte whose suggestions have contributed greatly to the work in this paper. The author wishes to thank Dr. S. P. Frankel, Laguna Beach, Calif., for helpful discussions.

References

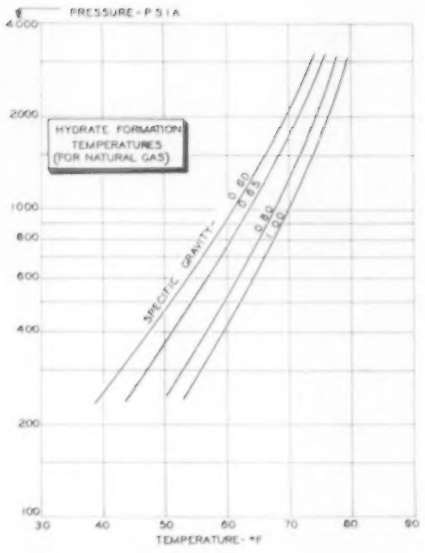
1. de Witte, L., and Radd, F. J., "Corrosion of Oil-Well Casing by Earth Currents," fall meeting A.I.M.E., San Antonio, Oct. 17-20, 1954.

2. Janssen, H., and von Otto, H., "Beitrage zur Berechmung der spezifischen Gebirgswiderstande in Tiefbohrungen" (Contributions to the Calculations of Formation Resistivities in Drill Holes), Erdol and Kohle 5, Nov. 1952, pp. 702-707.

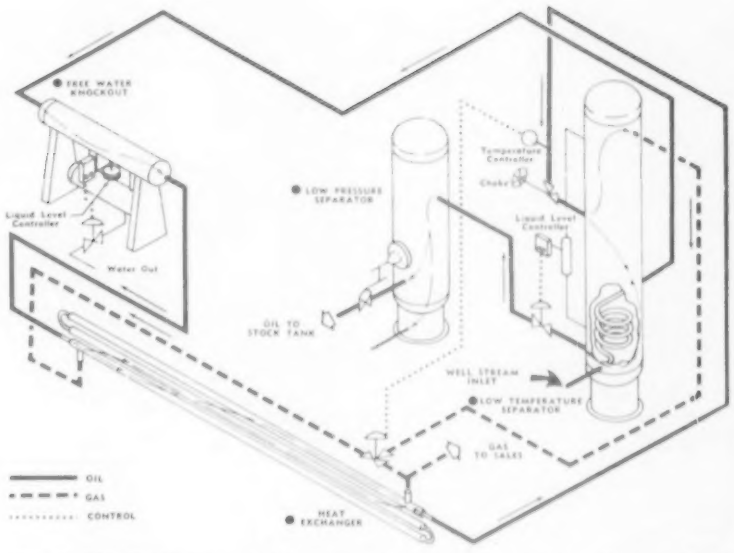
3. G Kortum and J. O'M. Bockrus, "Textbook of Electrochemistry," Vol. II, pp. 425-436, Elsevier Publishing Co., 1951, New York.

4. Guy O. Buckner, Jr., "Theory of Guard Electrode," manual by Halliburton Oil Well Cementing Co., Duncan, Okla., May 18, 1950.

5. Sudbury, J. D., Landers, J. E., Shock, D. A., "External Casing Corrosion Control," A.I.M.E. fall meeting, Oct. 17-20, 1954, San Antonio.



TYPICAL hydrate-formation temperatures for natural gas. Fig. 1.



FLOW DIAGRAM for typical low-temperature separation system. (Courtesy Black, Sivalls & Bryson, Inc.) Fig. 3.

ELEMENTS OF FIELD PROCESSING . . . Part 3 of a Series

How Temperature Affects Separation

by John M. Campbell

These rules of thumb on temperature in separation generally hold true:

1. When separating only to get stock-tank fluid for sale as crude oil and when residue gas is salable the amount of liquid is usually at the optimum between 15° and 30° F.

2. On small leases producing less than 2 M.M.c.f.d. the return per dollar of investment is often greater at separation temperatures of 40°-60° F.

3. The recovery of propane and butane by refrigeration alone is seldom justified economically if the temperature needed is less than —15° F.

4. Separation at a temperature above 85° F. is seldom justified.

VERY often temperature is the only effective variable we can control in the separation of oil and gas. The composition of the gas is largely out of the control of the operator, while the pressure is usually set by the sales pressure.

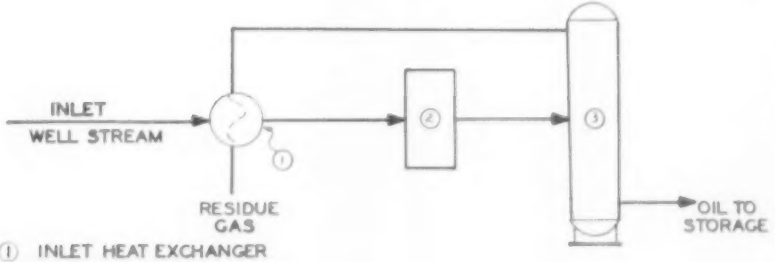
Author is with department of petroleum engineering, Oklahoma University.

Control of temperature almost always involves cooling, for well-stream flowing temperatures are normally above the best separation temperature. We can get cooling by any one or more of these:

1. Atmospheric or forced-draft air cooling.
2. Water-gas heat exchanger using a cooling tower or evaporative-type cooler.
3. Refrigeration.
4. Expansion of the well stream across a choke or valve under substantially adiabatic conditions.

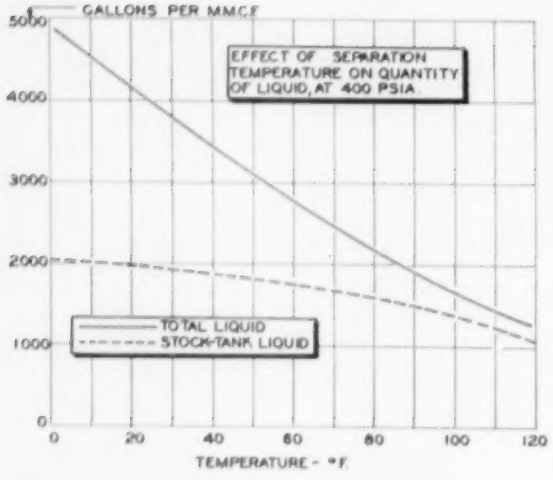
Of course, the first is limited by atmospheric temperature, so it cannot be used widely in the Southwest or Gulf Coast area. Some forced-draft air coolers bring the well stream to within 10° F. of the dry-bulb temperature, but "standard" units are for a 20° F. approach. Atmospheric units normally give a 25°-35° F. approach to the atmospheric dry-bulb temperature.

Some typical temperatures . . . In heat-exchanger design, costs require that the outlet water temperature be within 10° F. of the inlet well stream. The inlet-water temperature depends not only on the method of cooling but also on atmospheric conditions. In general, though, the inlet water to the heat exchanger can be cooled within 7° F. of the atmospheric wet-bulb temperature.

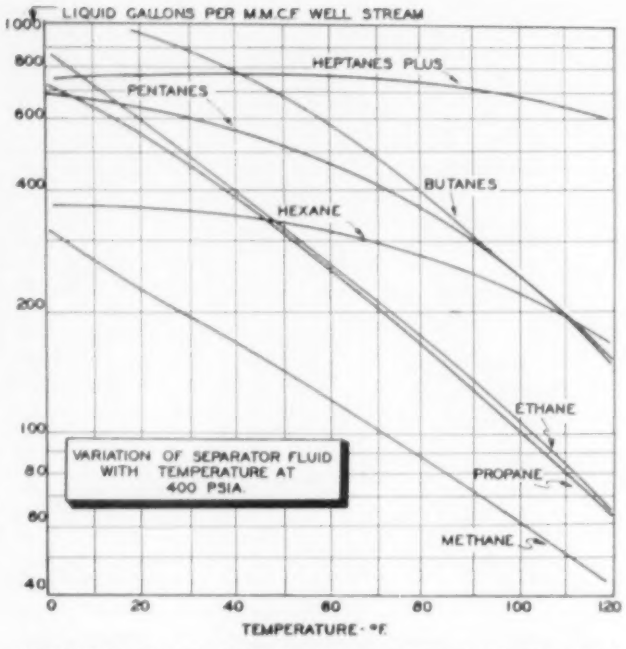


① INLET HEAT EXCHANGER
② MEANS OF COOLING
a WATER HEAT EXCHANGER
b AIR COOLING c REFRIGERATION
d EXPANSION ACROSS CHOKE (OR COMBINATIONS OF SEVERAL)
③ SEPARATOR

SIMPLE LEASE HOOKUP for lowering well-stream temperature above hydrate point. Fig. 2.


GALLONS PER MM.C.F.
EFFECT OF SEPARATION TEMPERATURE ON QUANTITY OF LIQUID, AT 400 PSIA
TOTAL LIQUID
STOCK-TANK LIQUID
TEMPERATURE - °F.

QUANTITY of separated liquid as a function of temperature, at 400 psia. Fig. 4.



VARIATION of separator fluid with temperature at 400 psia. Fig. 5.

On this basis a water heat exchanger and an induced-draft cooling tower will give these typical well-stream temperatures:

Area—	Temp. (°F.)
Lafayette, La.	100
Houston	96
San Antonio	93
Abilene, Tex.	91
Kilgore, Tex.	95
Oklahoma City	92
Amarillo, Tex.	87
Rocky Mountain area	81

All of the above should not be exceeded over 5 per cent of the time during the summer months. The winter months, of course, usually are no problem.

Refrigeration types . . . Refrigeration is a subject within itself and involves a comparison of the types available and their limitations. The temperature we can attain with refrigeration have no **effective** limits. But there are many **practical** ones. For instance, if the separator temperature is below the hydrate formation temperature, special measures are necessary to combat the hydrates.

Below —115° to —120° F. steel rapidly loses its ductility due to carbon embrittlement. Lower temperatures make necessary low-carbon steel or special metals. Consequently, few units are designed to operate at lower temperatures unless they are for ethane recovery.

Expansion is the most common of the cooling systems because the high-pressure gas is becoming more common. Also little capital outlay is involved with an expansion system.

Hydrate Formation

The hydrate formation temperature mentioned above depends on pressure. It is the temperature at which a portion of the gas is chemically combined with water present in the gas to form hydrates. These hydrates differ in structure from ice; but they are solid under hydrate conditions and may block a line or separator. They are opaque white when solid. When melted they form a milky hydrocarbon-water emulsion. In fact, the presence of hydrates may often be determined by removing pressure and draining the vessel.

Hydrate formation is not fully understood. However, a correlation such as Fig. 1 is useful. Each curve is actually a band rather than a line and applies only to gases of "normal" combustion. Sour gases and those of abnormal composition might show different action; but the curves shown are good for most calculations.

System Characteristics

Figs. 2 and 3 are flow diagrams of typical systems for reducing temperature. They are very similar except that the low-temperature system is, of course, more complex. The dividing line between the two is essentially the hydrate-formation temperature, the former having application only when no hydrates are formed.

In Fig. 2 the separator is the conventional oil-field type. The heat exchanger is normally of the pipe-in-pipe style but shell-and-tube types are applicable. Its purpose is to cool the inlet well stream with the cold residue gas from the separator in order to reduce the amount of cooling at Point 2.

The flow diagram in Fig. 3 shows one form of the equipment devised for operating a separator below the hydrate point. Such a system may have more or less equipment than that shown, depending on the requirements.

This particular system handles the hydrates formed by melting them, using a coil in the bottom of the separator. The heat necessary may be furnished by the warm inlet well stream (as shown) or by a water heater or steam generator.

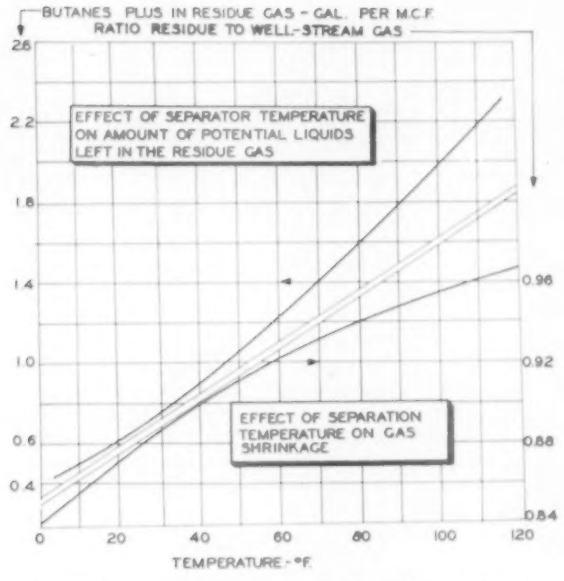
Where little free water is produced, the free-water knockout is sometimes eliminated. When this is done the systems shown in Figs. 2 and 3 become very similar except for the separators.

Another form of low-temperature-separation system prevents hydrate formation by the addition of an inhibitor. This is usually a dilute solution of one of the glycols, although alcohol is sometimes used. This system is more flexible than that shown in Fig. 3 but is more complex and expensive.

Effect of Temperature on Liquid

To illustrate effect of temperature on the liquid and gas, refer to the well-stream analysis at 400 psia. in Table 1, Part 2 *(The Oil and Gas Journal, April 11, 1955, p. 122)*. Temperatures ranging from 120° to 0° F. will be applied to this mixture for our study here.

There has been a tendency on the part of many to operate the separator as close to 0° F. as possible without regard to the economics involved. This increases the investment. It can often lead to lower net income if the residue gas is being sold at an attractive price. In many cases where only stock-tank



EFFECT of separator temperature on the residue gas. Fig. 6.

fluid is desired, the optimum temperature is actually between 20° and 25° F. A complete analysis on the system used here, for example, gave an optimum temperature of 21° F. at 900 psia.

This is partially explained by Fig. 4. It shows the variation in the quantity of stock-tank fluid and total fluid with temperature at 400 psia. In lowering the temperature from 120° to 0° F. the amount of stock-tank liquid about doubles while the total liquid is increasing about four times. Any liquid condensing that is not marketable reduces the quantity of salable residue gas accordingly. The approximately 3,000 gal. of nonstock-tank liquid shown at 0° F. in Fig. 4 has a market value, as gas, of about $15 based on a sales price of $0.12 per M.c.f.

There is obviously some temperature then at which the optimum revenue occurs per dollar of investment.

Fig. 4 shows that there will be little additional stock-tank revenue by reducing temperatures much lower than 0° F. In fact, from 20° F. down the curve becomes awfully flat. All calculations assume that the only product desired is one that may be held in atmospheric stock tanks. In the event propane or L.P.G. or both are desired as products, the curve would not be so flat.

Fig. 4 is verified by the results shown in Fig. 5, a breakdown of the separator liquid by components. The curves clearly show effect of temperature on quantity of the various hydrocarbons. The lighter hydrocarbons (methane, ethane, and propane) increase rapidly with decreasing temperature. This accounts for the rapid increase in total separator fluid.

Temperature has little effect on the quantity of the heptanes plus. Consequently, where the final fluid is composed primarily of "heavy" ends, there is little advantage in decreasing temperature.

Note, though, that there is a rapid increase in the heptanes plus and hexane. It is these which largely account for the increase in stock-tank fluid shown in Fig. 4. Consequently the ratio of pentane and hexane to the heptane plus fraction has a great effect on the percentage increase of the stock-tank liquid with decreased temperature. No specific correlations are available but this has been shown to be generally true.

In an increasing number of cases the desired gas properties determine the choice of the separator temperature. Therefore, it is often necessary to give consideration to water dew point, hydrocarbon dew point, and heating-value specifications.

In most instances optimum separation temperature is lower than needed for water dew-point requirements. Therefore, there is no problem in that regard. However, temperatures less than +10° F. are often required to satisfy hydrocarbon dew-point and heating-value specifications. This is illustrated by the upper curve of Fig. 6, which is typical of that for a "rich" well stream. As might be expected, the heating-value curve has the same general slope.

Heating-value specifications are a different problem with gases containing large quantities of inerts such as nitrogen, carbon dioxide, and helium. The quantity of liquid from such gases is often relatively small, and gas revenue is more important. Consequently, low temperatures might not be feasible.

The extra liquid condensed might lower the heating value below the minimum specified, or lower the sales value by the imposition of a heating-value penalty clause.

Loss of revenue due to gas shrinkage is, of course, a problem in many cases. Lower curve of Fig. 6 illustrates results.

Plant Makes First Shipment of Isooctyl Alcohol

INDOIL CHEMICAL CO. recently shipped its first tank car of isooctyl alcohol from the Wood River, Ill., refinery of Standard Oil Co. (Ind.). Indoil is a Standard subsidiary. The alcohol was produced in the Oxo alcohol plant, just completed. Isooctyl alcohol is primarily used in the manufacture of plasticizers for vinyl resins. Present for the shipment were W. B. Plummer, president of Indoil; H. E. Cotton, manager of Standard's Wood River refinery; H. R. Peterson, sales vice president for Indoil; Ray Jack, assistant general superintendent at the refinery; and Al Porter, assistant general foreman at the refinery. (See cut.)

In the Oxo process unsaturated hydrocarbons, or olefins, are reacted with a gaseous mixture of hydrogen and carbon monoxide at temperatures of 300°-400° F. and at pressures up to 3,000 psi. A cobalt-type catalyst causes a complex addition reaction, producing aldehydes having one more carbon atom than the olefin charge. The feed stock for the isooctyl alcohol process is a concentrated heptene fraction.

The crude aldehydes are purified and then further reacted with hydrogen at very high pressure in the presence of another catalyst to form crude alcohol. This is then purified and fractionated to yield a highly refined product. The hydrogen used and the hydrogen-carbon monoxide mixture are made by the catalytic interaction of steam and refinery gas.

Six catalysts are used in the complete operation.

Here are details of a

New Dry-Furnace Carbon-Black Process

Very high yields result from either liquid or gas feed

by W. H. Balka

THE Lynn Furmatic process is primarily a gas-feed process. But excellent results have also been obtained when using oil in conjunction with the gas-feed stock.

Patent applications for the oil burner are in progress. Many tests made on the oil black obtained show it to be in a very competitive position.

Economic studies show that with the Lynn process a gas operation may still be profitable, even with 20-cent gas. Actual plant costs are also about 30 per cent less per pound of carbon-black recovery than conventional furnace-type plants and will as a rule be amortized in little better than 1 year, depending of course on gas costs and analysis.

This article gives the basic features of the Lynn Furmatic process. It is distinguished in particular by the high yields achieved. Some of the highlights on carbon black and its manufacture in general are also included.

Furmatic Carbon Black Process

The Lynn process can properly be described as a dry furnace method. Its reactions tend to very dry products of combustion. Water formation is held at a minimum. A dry operation is further carried out throughout the entire process. Cooling is done with air and pelletizing also uses the dry method.

The word Furmatic was coined from the words, furnace and automatic. The process was conceived by Rice P. Lynn, a San Angelo, Tex., attorney. He has worked on the process over a period of about 20 years. About 3 years ago a large-scale pilot plant was constructed in the San Angelo area with a capacity of 30,000 cu. ft. of gas charge per calendar day. About 2 years ago engineering talent was brought into the picture and changes made where needed with resultant very high carbon-black recoveries.

Operation . . . In the Lynn process, four distinct reactions take place: (1) in the burners, (2) in the dissociation zone, (3) in the cracking zone, and (4) in the primary cooler. These will be described as they occur through the flow sheet and consistent with the secrecy demanded.

The system is of the low-pressure type throughout. The furnace is rectangular in shape with a cone on top. Its interior contains the gas and oil burners, a vertically adjustable hood, access and explosion doors, peep holes, etc. Burners may be gas only or both gas and oil.

Gas burner . . . This is of circular shape with many burner openings or ports. The original gas burner was a sphere *(The Oil and Gas Journal, November 24, 1952, page 72)*. This was found to be too cumbersome for the larger installations. The maximum capacity for a one unit plant is 2.5 M.M.c.f. of gas per calendar day. Larger plants require additional units for optimum operation.

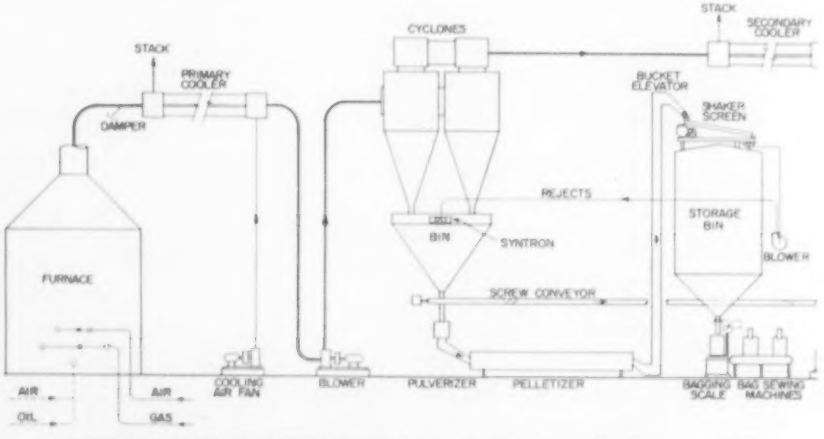
Oil burner . . . A special air-cooled oil burner was designed for use with this furnace thereby making it suitable for use where liquid hydrocarbons may be the primary fuel.

Gas Feed

Gas is introduced into the interior of the gas burner and preheated combustion air on the outside. The gas-to-air ratio may vary from 4:1 to 8:1 depending upon the product desired and the feed-gas analysis. The flame is of the unimpinged round type with a maximum temperature of 2,200° F. in the nonluminous sheath. Oxidation occurs around the whole mantle of the flame, forming an invisible hot outer zone of carbon dioxide. Depending on temperatures and pressures, there also possibly occur the formation of methanol, formaldehyde, formic acid, carbon dioxide, carbon monoxide, and hydrogen. As the unburned gases rise within the flame mantle, air diffuses through the CO_2 layer and some oxidation occurs. Thereby some of the hydrocarbons are broken down, forming carbon by pressure oxidation.

The luminous zone of the flame has a definite yellow color which is caused by incandescent solid carbon particles. In this zone there exist methane, ethane, carbon dioxide, carbon monoxide, hydrogen, nitrogen, and water vapor. About 9 per cent of the carbon black recovered is produced in this zone. Secondary combustion may, however, reduce this amount considerably. A very fine black is produced. The operating temperature varies from 2,100° to 2,500° F.

Since the velocity through the burners is comparatively low, all of the combustion air is not consumed and progresses to the dissociation phase. This operates at higher temperatures with gas and air thermally decomposed in part to carbon, hydrogen, and water



SCHEMATIC FLOW SHEET for the Lynn Furmatic carbon-black process. Either

vapors. This may also be termed a chain reaction where the hydrocarbons rapidly dissociate into free hydrocarbon radicals. The furnace temperature varies from the lower section to the upper zone. In the latter actual thermal cracking occurs within the hood which also acts as a catalyst. The temperature in the upper zone is on the order of 2,800° F. This temperature again may vary and is dependent on the charge stock, type of black to be made, etc.

Primary cooler . . . A fourth reversible and corpuscular reaction occurs in the primary cooler where the carbon black and products of combustion are cooled to approximately 1,000° F. Since cooling is on a gas to gas basis, both the quantity and quality of the carbon black are enhanced with resultant carbon-black yields well over 50 per cent in excess of the best modern furnace methods.

The coolers may correctly be termed heat exchangers. They use atmospheric air with counterflow. The primary cooler may use its heat in a waste-heat boiler where such recovery would be advantageous, as in the northern latitudes, and it is possible to generate sufficient steam to operate the fans and other prime movers.

From the primary cooler the carbon black and gases enter a series of cyclones where between 60 and 70 per cent of the black is separated. The black then enters a bin, a deaerator, and is then pulverized. It is then sent to a dry-type pelletizer or sacked as a fluffy black. Or it may be sent to the final gathering system and mixed with the finer black for either bagging or pelletizing.

From the cyclones the remainder enters a secondary cooler where it is cooled to about 275° F. and thence to a dust-tube collector which collects 99 per cent of the black. Products of combustion enter the atmosphere as a clear gas with none of the smoke so prevalent in many of the present systems.

Process Control

Much thought was given to making the Lynn Furmatic process fully automatic. Only the bags will be manually handled, and from a loading standpoint only. A brief description of the instrumentation follows.

Combustion air will be filtered and enter the furnace through a duct where it will be preheated and suitably dispersed. The duct contains a short cone venturi and a pneumatically operated butterfly valve. This valve will be controlled by a receiver ratio flow controller mounted on the instrument panel, and will receive the air and gas flow rates from a locally mounted air weight and gas flow transmitter.

Gas flow transmitter . . . This controls the air flow by throttling the butterfly valve and maintains a precise air-gas flow ratio to the furnace. A valvactor is mounted on the valve to overcome friction or a dead space and to assure accurate valve positioning and air flow control.

Air weight transmitter . . . This automatically compensates for any change in atmospheric pressure and temperature. Both a gas-flow transmitter and recorder are installed in the gas line to the furnace, complete with 24-hour charts for recording both differential and static pressures. Daily gas volumes are computed from these charts. Gas pressure to the furnace will be automatically controlled by two locally mounted indicating pressure controllers. These will throttle valves to the required pressure in the gas line and downstream from the gas flow transmitter and its orifice plate.

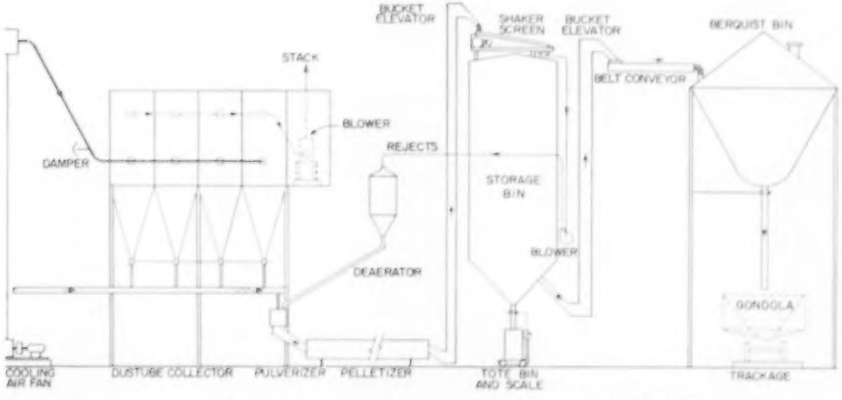
Temperatures . . . Preceding the primary cooler, four thermocouples are installed at various points in the furnace and gas duct. Five other plant temperatures are read by means of a multipoint temperature recorder located on the instrument panel. All of these are located beyond the primary cooler.

An outside air damper is placed between the furnace and the primary cooler to temper gases or to increase its volume when necessary in running with minimum combustion air, or to maintain necessary conveying velocities. This damper is automatically controlled by a recording pressure controller mounted on the instrument panel. A second damper is installed between the secondary cooler and the dust-tube collector for a similar reason. This damper is controlled automatically with a resistance recording temperature controller also mounted on the instrument panel.

Hot gas and cooling fans are equipped with fluid drives. The primary cooling fan drive is automatically controlled by a resistance temperature recording controller mounted on the instrument panel. The primary hot-gas fan drive is automatically controlled by a recording pressure controller mounted on the instrument panel. The secondary cooling-fan drive is automatically controlled by a resistance recording temperature controller mounted on the instrument panel. The secondary hot gas fan drive is controlled by a recording pressure controller also mounted on the instrument panel. Both pressure controllers are receiving controllers and their indicating transmitters are locally mounted.

Various air-gas ratios are obtained by changing control settings from the instrument panel. The pressure in the furnace is recorded with a pressure receiver recorder mounted on the panel. An indicating pressure transmitter is also installed and locally mounted. Line pressures are read at various locations with locally mounted dial pressure indicators.

Outside motors, starters and lighting are explosionproof. Interior electrical equipment conforms to code require-



gaseous or liquid hydrocarbons may be used as fuel. Very high yields result.

THE AUTHOR

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ments or better. All motor driven equipment as a rule is push-button started. Gas burners are lighted with an electric ignition system which lights gas pilots. In case of flame failure within the furnace, automatic instantaneous-action valves shut off the gas to the burners and a horn will sound. A flame detector is also a part of the operation. With the above system only one operator is required per shift for actual plant operation.

Basic features of the newest process in carbon-black manufacture have been given. What follows deals in general with the carbon-black industry.

Early Manufacture

The first plant for the successful manufacture of carbon black was erected in the city of New Cumberland, W. Va., in 1872; and the first patent was issued to L. J. McNutt in 1892 for the method now known as the Channel process. As early as 1864, manufacturers of printing inks, who had been using lampblack, discovered that the carbon made by burning artificial gas with an insufficient amount of air, gave the ink a very glossy and intense black. The New Cumberland plant used natural gas as the charging stock, but the product did not possess all of the properties of the blacks made from artificial gas. This plant was constructed of wood, later burned and was never rebuilt.

In the latter part of the nineteenth century the manufacture of artificial carbons received its greatest impetus. Continued improvements were made with different approaches to the methods used, so that by 1930 the quantities produced were in the order shown (Mantell, Industrial Carbon).

1. The Channel process.
2. The small rotating disk operation.
3. The large plate method.
4. The roller process.

It was about this time that the writer did some work with the roller process and received his first carbon-black experience. Today the carbon-black industry is a large one. Lately the actual number of plants have decreased due to increased plant efficiency and the absolescence of the channel or contact type of plants which are rapidly being retired and superseded by the furnace plants. Present commercial processes fall into the following categories in the order named:

1. The channel or contact.
2. The gas-furnace process.
3. The oil-furnace process.
4. The cyclic or thermatomic process.

For the year 1953, the furnace blacks accounted for 65.3 per cent of the total blacks produced in the United States, the channel blacks 28.2 per cent, and the cyclic blacks about 6.5 per cent. Domestic consumption accounted for some 75 per cent with 25 per cent being exported (Bureau of Mines Minerals Yearbook, 1953).

Ink Blacks

The making of inks dates back to antiquity, but the use of carbon black as a printing-ink pigment is much more recent and became industrially important about the middle of the nineteenth century. The carbon black of that day was a very expensive item due to the necessary refinement in order to make the fine-grained inks.

Today's inks include all of the multitude of types such as book, engraving, lithographing, rotogravure, photogravure, metallic, tattoo, fingerprint, and drawing, as well as carbon papers and inks, typewriter ribbons, quick-set, stamp-pad and many others.

Some ink manufacturers still use a small amount of lamp and acetylene blacks, but their present use is limited and they are rapidly being superseded by the modern furnace blacks. Table 1 shows some of the required characteristics of color blacks.

An inspection of Table 1 will show some of the possible variations in properties that obtain in carbon blacks, used as pigments only.

Rubber Blacks

Some 45 years ago it was discovered that carbon black greatly increased the toughness, strength, and resistance to wear of natural rubber, that it was able to impart reinforcing and abrasion resistance as well as tensile properties to all rubber products. Many people living today can recall when an automobile tire would last all of 3,000 miles before wearing out and that 5,000 miles was considered exceptional. Blowouts were frequent, and it was only after much research that chemists were able to compound carbon black with rubber to make a tougher, more serviceable tire-tread stock.

Today about 34 lb. of black is required for each 100 lb. of rubber product. The Paley Commission Report estimates that carbon-black production will more than double within the next 20 years. It further foresees that within this period most of the blacks will be made from oil rather than natural gas. This prediction is of particular interest at this time since the rising costs of natural gas, and the relatively inefficient methods of producing blacks from natural gas, which utilize only about one-tenth of the potential energy in the gas, compared to some 50 per cent recovery in the use of liquid hydrocarbons make the so-called oil blacks appear attractive.

Oil blacks . . . These find their most important applications in rubber goods. Tests indicate that pigment blacks require approximately 50 per cent of natural gas along with the oil in order to make a good marketable black. Even the oil furnaces require some 10 per cent of gas in order to furnish the necessary heat to crack the liquids. Natural gas is still the best feed stock for quality products available. Table 2 shows some of the required characteristics of the rubber blacks.

TABLE 1—COLOR BLACKS

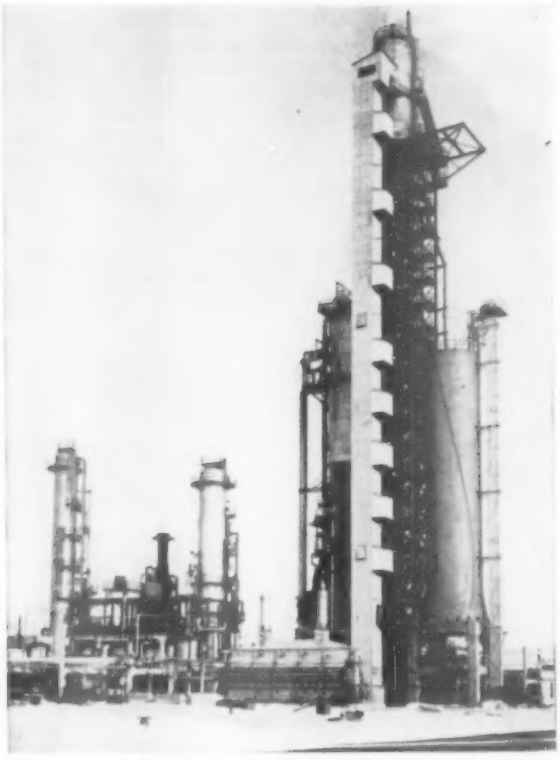
Trade name—	HCC	MCC	LCC	LIF	LB
Average particle diameter, μ	5-10	9-17	17-25	20-25	100-200
Color, Nigrometer scale	62-68	71-76	78	81	24-12
Specific gravity	1.99	1.85	1.82	1.82	1.78
Oil absorption, per cent	200-125	95-89	80-86	70	109-91
Sludge pH	3-5	2-6	4-5	2-3	5
Tinting strength	225	240	240	250	49-117
Moisture, per cent	6.0-3.5	3.5-1.5	2.0	6.0	0.2-0.04

Legend: HCC—High color channel. MCC—Medium color channel. LCC—Low color channel. LFI—Long flow impingement. LB—Lamp black.*
*Lamp black is shown only for comparison.

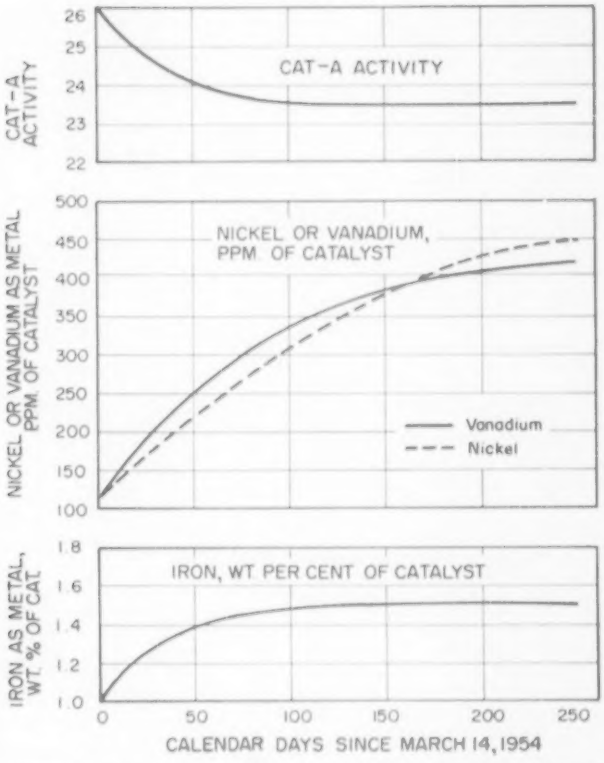
TABLE 2—RUBBER BLACKS

Trade name—	MPC	HMF	SRF	HAF	FEF
Base—	Gas	Gas	Gas	Oil	Oil
Avg. particle dia μ	25-30	60-65	70-90	33-35	45
Specific gravity	1.82	1.90	1.82	1.82	1.82
Toluene extractable, per cent		0.20	0.32	0.25	0.25
Benzine extractable, per cent	0.06-0.10	0.05	0.12		
Sludge, pH	3.5 -4.5	9-10	9-10	9.0-9.5	9.2-9.5
Volatile, per cent	5.0	0.7-0.9	0.9	2.0	1.5
Heat loss at 105° C., per cent	2.0	2.0	2.0	2.0	2.0
Ash at 550° C., per cent	0.15	0.35	0.35	0.50	0.50
Residue 325 mesh, per cent	0.10	0.10	0.10	0.10	0.10
Residue 80 mesh, per cent	0.005	0.005	0.005	0.005	0.005
Residue 30 mesh, per cent	0.000	0.000	0.000	0.000	0.000

Legend: MPC—Medium processing channel. HMF—High modulus furnace. SRF—Semi-reinforcing furnace. HAF—High abrasion furnace. FEF—Fast extruding furnace.



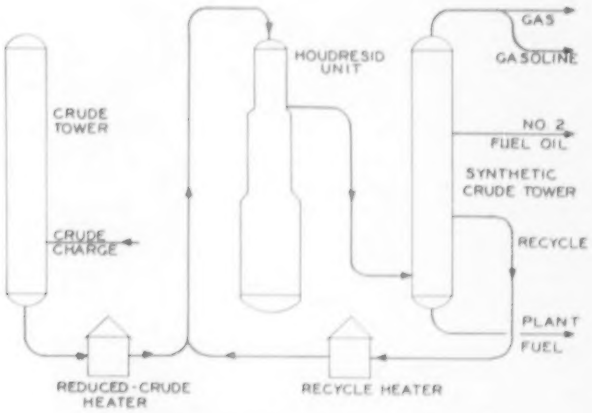
HOUDRESID INSTALLATION at the Sun Oil Co., Ltd., refinery at Sarnia, Ont.



HISTORY of metals accumulation on the catalyst and its effect on activity.

Houdresid Converts Crude Residua Into Profitable Products

. . . and provides more flexibility in kinds of crude that can be run



FLOW DIAGRAM of Houdresid cracking operation.

by J. C. Dart, G. A. Mills, A. G. Oblad, and C. C. Peavy

DEMAND for gasoline and light distillate fuels has been increasing more rapidly in recent years than demand for heavy residual fuels, with the result that the disposal of heavy fuels on a profitable basis has been, in many places, a burden to the refiner. Effort, therefore, has been devoted to developing new refinery processing techniques that provide greater flexibility with respect to product demand as well as product quality.

Authors are with Houdry Process Corp., Marcus Hook, Pa.

Houdry Process Corp. has developed Houdresid catalytic cracking to meet these needs. Houdresid is a new refinery-proved, continuous moving-bed catalytic cracking process for converting crude residua to high-quality distillate products.

Houdresid cracking utilizes either natural or synthetic catalysts, and the equipment required is similar in many respects to that employed in Houdriflow catalytic cracking.

Advantages . . . High yields of gasoline, with octane ratings typical of gas-oil catalytic cracking, are produced from residuum cuts ranging from crude-tower bottoms to vacuum bottoms. Novel process features eliminate the adverse

effects on product selectivity heretofore resulting when heavy metals are present in the feed. In addition, residua high in sulfur or nitrogen may be charged. Houdresid, therefore, gives refiners much greater flexibility in the kind of crude that can be run.

Using a long-range residuum, Houdresid has been in commercial operation for over a year. In addition, it has been studied extensively in the laboratory. This article describes the process, and presents pertinent results from both the commercial operation and the pilot-plant studies on a variety of charge stocks.

Commercial Application of Houdresid

The commercial demonstration was carried out at the Sarnia, Ont., refinery of Sun Oil Co., Ltd. The operation began on March 14, 1954, and has been conducted with outstanding success since that time. A simplified flow diagram of the Houdresid process now in operation at Sarnia is shown here, as well as a photograph of the Sarnia Houdresid system.

The total crude is fractionated to produce gas, gasoline, naphtha, kerosine, No. 2 fuel with an A.S.T.M. 90 per cent point no greater than 600° F., and bottoms. Reduced crude from this distillation, representing about 45-50 per cent of the crude, constitutes virgin feed to the Houdresid unit.

Synthetic crude from the Houdresid reactor is fractionated to produce gas, gasoline, No. 2 fuel, heavy gas oil, and a small bottoms cut which is consumed as refinery fuel. Heavy recycle gas oil is cracked to extinction.

The process and mechanical design of the Houdresid unit are based on information and equipment developed in the well-established Houdriflow gas-oil cracking process. Oil, catalyst, and air flows are similar to those in a Houdriflow unit previously described.[1,2]

Process results . . . Inspection of the reduced crude from mixed Louisiana, East Texas, and Mid-Continent crudes which is charged to the Sarnia Houdresid operation is presented in Table 1. The results of typical yield surveys are presented in Table 2.

TABLE 1—INSPECTION OF CHARGE TO THE SARNIA HOUDRESID OPERATION

Charge	Reduced crude from mixed Mid-Continent, Texas and Louisiana crudes
Gravity, °A.P.I.	26.9
Distillation, V.A., °F.:	
I.b.p.	650
50 per cent	804
E.p.	1,066
Recovery, per cent	84.0
Sulfur, weight per cent	0.47
Ramsbottom carbon, weight per cent	3.0
Nickel as metal, p.p.m.	4.6
Vanadium as metal, p.p.m.	6.1
Iron as metal, p.p.m.	9.4

TABLE 2—SARNIA HOUDRESID SURVEY RESULTS

Date—	3-19-54	5-27-54	11-16-54	2-3-55
Crude, bbl./stream day	10,180	12,360	12,111	12,800
Cracking temperatures, °F.	945	940	910	935
Houdresid charge:				
Reduced crude, bbl./stream day	5,020	5,453	5,489	6,410
Recycle, bbl./stream day	2,344	3,372	4,455	3,599
Total, bbl./stream day	7,364	8,825	9,944	10,009
Yields (based on fresh feed):				
Conversion, volume per cent	67.6	65.3	69.8	67.6
Debutanized gasoline, 385° F. at 90 per cent, volume per cent	48.5	50.1	52.7	51.6
No. 2 fuel, volume per cent	25.4	22.1	} 30.2	23.0
No. 5 fuel, volume per cent	7.0	12.6		9.4
C_4 cut, volume per cent	14.8	12.4	12.9	13.1
Dry gas, weight per cent	10.3	8.4	7.3	7.9
Coke, weight per cent	7.1	5.9	8.2	5.9
Cracking efficiency, $\frac{\text{Vol. per cent gasoline} \times 100}{\text{Vol. per cent conversion}}$	71.7	76.7	75.5	76.3
Hydrogen, std. cu. ft./bbl. of residuum converted	129	147	108	138
Inspection of C_5+ gasoline:				
Octane number F-1 clear	93.0	90.7	88.4	91.6
F-2 clear	79.9	79.1		79.1
R.v.p.	6.0	5.1		6.2
Sulfur, weight per cent	0.08	0.08		0.08

TABLE 3—HOUDRESID C_5+ GASOLINE YIELDS, BEFORE AND AFTER POLYMER GASOLINE BLENDING

Survey date—	3-19-54	5-27-54	11-16-54	2-3-55
Plant data—Debutanized gaso., vol. per cent	48.5	50.1	52.7	51.6
F-1 clear octane	93.0	90.7	88.4	91.6
Calculated debutanized gaso. plus polymer				
Gasoline, vol. per cent	58.6	58.6	61.2	60.3
F-1 clear octane	94.7	92.5	90.3	93.2
Calculated total 10-psi. R.v.p. gaso., vol. per cent	62.8	63.4	65.9	64.3
F-1 clear octane	95.2	93.8	91.2	93.7

Conversion ranged from 65 to 70 volume per cent, variation being consistent with changes in throughput, recycle ratio, space rate, catalyst-to-oil ratio, and temperature during the residuum cracking operation.

The C_5+ gasoline yields varied from about 48 to 53 volume per cent, and coke yields (catalyst deposit) varied from approximately 5.9 to 8.2 weight per cent.

Considering changes in processing conditions, correlation of these data and data from other surveys indicates no significant shift in product distribution with time. Thus, the heavy metal contaminants which accumulated on the catalyst had no effect on the Houdresid process results.

Further evidence of this is demonstrated by the hydrogen yield expressed as standard cubic feet per barrel of residuum converted. Hydrogen production has remained essentially constant throughout the Houdresid run. In conventional gas-oil cracking, metal contamination of the catalyst is accompanied by a pronounced increase in hydrogen production.

Unsaturation in the C_4 cut from the commercial operation has been consistently greater than 60 per cent, and C_3 cut unsaturation has been more than 75 per cent. These data are typical of Houdresid process results, and represent a substantial increase in unsaturation of these cuts over that obtained from gas-oil catalytic cracking. Therefore, the Houdresid process provides a greater potential polymer gasoline yield from polymerization of the C_3 and C_4 cuts.

The yields and octane ratings of the C_5+ gasoline, without and with polymer gasoline and the latter blended to 10-psi. R.v.p. are presented in Table 3. The yields of 10-psi. R.v.p. gasolines (including calculated cat poly gasoline from polymerization of Houdresid C_3 and C_4 olefins) range from 63 to 66 volume per cent of long range residuum and F-1 clear octanes range from 91 to 95.

Rugged catalyst . . . From March 14, 1954, to November 16, 1954, 802,000 bbl. of residuum produced from 1,663,000 bbl. of crude oil was charged to the Houdresid process at Sarnia. The history of metals accumulation on the catalyst and its effect on activity, as determined by the CAT-A laboratory test[3]

during this period, are shown graphically in an accompanying chart.

The CAT-A activity of the natural catalyst was 26 prior to residuum operation, and appears to have stabilized at 23.5. The gas and coke yields remained normal for these activity levels. Iron content of the catalyst increased from 1.0 to about 1.5 weight per cent and has remained at this value.

Total nickel-plus-vanadium content of the catalyst was about 200 p.p.m. before Houdresid operation commenced. This represents the approximate maximum tolerable limit of contamination in gas-oil catalytic cracking.[4] Contamination above this limit in conventional catalytic cracking markedly influences cracking selectivity, so that high yields of light gases and coke, and low yields of gasoline, are the result of ordinary processing.

By November 16, 1954, after 8 months of Houdresid operation, the total nickel-plus-vanadium content of the catalyst had reached 870 p.p.m. It is extremely significant, therefore, that in Houdresid catalytic processing, these high concentrations of contaminants had no effect on product distribution or quality. In effect, the iron originally present in the natural catalyst along with the iron, nickel, and vanadium deposited thereon during processing have been rendered inactive.

Catalyst consumption . . . Catalyst attrition on the Sarnia Houdresid unit averaged 2.5 tons per day (0.4-0.5 lb. catalyst per barrel of reactor charge). The commercial experience has demonstrated that it is not necessary to withdraw catalyst, over and above that required from normal mechanical loss, in order to maintain selectivity and activity.

A salient Houdresid feature which minimizes the effect of metallic contaminants in the charge is the pelleted form of the catalyst. Metal deposition occurs predominantly on the very exterior of the pellet. This deposit, in turn, is most susceptible to removal by the normal gentle grinding action occurring in a moving bed. Substantial amounts of the metal are thus physically removed from the catalyst, and eliminated with the catalyst fines.

By March 21, 1955, more than a year after the new Houdry process was placed in commercial operation, approximately 1,127,000 bbl. of reduced crude (produced from about 2,336,000 bbl. of crude) had been processed in the Sarnia Houdresid unit. During this period, yields and product quality have remained high and unchanged. Thus, it has been demonstrated by commercial operation for a truly significant period that Houdresid cracking is a feasible and attractive process for producing quality products from reduced crude.

TABLE 3—COMPARISON OF HOUDRESID PILOT PLANT AND COMMERCIAL RESULTS

	Pilot unit	Commercial unit
Conversion, vol. per cent	70.0	69.8
Debut. gaso., 385° F. at 90 per cent, vol. per cent	50.5	52.7
Total gas oil, vol. per cent	30.0	30.2
C_4 cut, vol. per cent	15.2	12.9
Dry gas, wt. per cent	9.8	7.3
Coke, wt. per cent	7.9	8.2
Cracking efficiency, $\frac{\text{vol. per cent gaso.} \times 100}{\text{vol. per cent conversion}}$	72.2	75.5

Laboratory Studies

Pilot-plant studies have been carried out to establish the various features of the Houdresid process, including a correlation of results of pilot-plant and commercial operation.

It has been established thereby that both natural and synthetic catalysts may be used, and that an inexpensive natural catalyst is particularly well suited to Houdresid.

A wide variety of long and short-range residua, particularly those containing high concentrations of contaminants, has been evaluated. Typical results from these stocks, along with data comparing pilot-plant and commercial operation, are presented in accompanying tables. The pilot plant used for these studies has been described previously in connection with the development of Houdriflow catalytic cracking.[5,6,7]

Pilot unit and Sarnia Houdresid data from equivalent operation are presented in Table 4. The commercial data are

TABLE 5—HOUDRESID PROCESSING OF LONG RANGE RESIDUA

	40 per cent E. Tex. reduced crude	27.5 per cent S. Cen. Tex. mixed reduced crude
Charge stock—		
Gravity, °A.P.I.	23.7	22.7
Sulfur, wt. per cent	0.54	0.52
Nitrogen, wt. per cent	0.17	0.11
Ramsbottom carbon, wt. per cent	4.5	2.8
Nickel as metal, p.p.m.	7.5	7.0
Vanadium as metal, p.p.m.	<2.5	5.0
Yields, per cent of fresh feed—	Once-through	Once-through
Debut. gaso., vol. per cent	44.3	40.5
Cat. gas oil, vol. per cent	39.7	44.1
C_4's, vol. per cent	13.8	11.0
Dry gas, wt. per cent	7.9	9.5
Coke, wt. per cent	6.9	6.2
Inspections of C_5+ gasoline:		
F-1 clear octane	91.6	94.1
Sulfur, wt. per cent	0.06	0.11

TABLE 6—HOUDRESID PROCESSING OF HEAVY RESIDUA

	10 per cent mixed Mid-Continent, Tex. and La. reduced crude	10.6 per cent S. Central Tex. mixed reduced crude	4.1 per cent S. Central Tex. mixed reduced crude
Charge stock—			
Gravity, °A.P.I.	12.6	17.7	12.7
Sulfur, weight per cent	0.91	0.72	1.02
Nitrogen, wt. per cent		0.20	0.36
Ramsbottom carbon, wt. per cent	12.4	5.3	14.0
Nickel as metal, p.p.m.	18.8	18.2	47
Vanadium as metal, p.p.m.	7.4	13.0	33
Yields, per cent of fresh feed:	Once-through	Once-through	Once-through
Debut. gaso., vol. per cent	40.1	42.6	40.4
Cat. gas oil, vol. per cent	40.2	37.0	27.1
C_4's, vol. per cent	10.4	13.1	15.6
Dry gas, wt. per cent	7.3	11.6	13.5
Coke, wt. per cent	16.3	8.5	17.6
Inspections of C_5+ gasoline:			
F-1 clear octane	89.3	93.4	90.7

TABLE 7—HOUDRESID PROCESSING OF RESIDUA CONTAINING HIGH CONTAMINANT CONCENTRATIONS

	Ordonez topped crude	Boscan topped crude	Heavy, Wyo. reduced crude		Kuwait Vac. bottoms
Charge stock—					
Gravity, °A.P.I.	12.3	7.7	12.2		9.7
Sulfur, wt. per cent	3.72	4.96	3.48		5.03
Nitrogen, wt. per cent	0.42	0.70	0.38		0.33
Ramsbottom carbon, wt. per cent	13.3	10.4	11.8		16.7
Nickel as metal, p.p.m.	44	74	37		42
Vanadium as metal, p.p.m.	242	1,090	76		98
Yields, per cent of fresh feed:	Once-through	Once-through	Once-through	Recycle	Once-through
Debut. gaso., vol. per cent	29.2	33.9	31.1	48.2	37.1
Cat. gas oil, vol. per cent	49.6	43.8	44.5	26.1	34.6
C_4's, vol. per cent	7.0	7.0	10.6	10.1	9.6
Dry gas, wt. per cent	9.8	8.8	10.4	12.3	9.7
Coke, wt. per cent	15.1	18.6	15.2	18.2	22.1
Inspections of C_5+ gasoline:					
F-1 clear octane	90.3	92.1	91.8	93.6	88.9

from the survey of November 16, 1954, at which time 802,000 bbl. of residuum had been processed. In general, the product distributions are in excellent agreement, and demonstrate that the pilot-unit data are representative of results from commercial Houdresid operation.

Processing Long-Range Reduced Crudes

In the general category of long-range reduced crudes, the charge stocks studied represent material boiling above virgin No. 2 fuel oil, and range in Ramsbottom carbon content from 2.8 to 4.5 per cent.

Typical results from two of these stocks are presented in Table 5. With these stocks, once-through operation gives reasonably high yields of gasoline. Pilot-plant yields here, and in the following tables, do not include potential polymer gasoline. The coke yields are slightly higher, naturally, than would be expected from a clean catalytic gas oil. However, the liquid recoveries from operation of these stocks are very high.

The yield of C_4 is exceptional from both charge stocks, and the inspections of the gasolines are excellent. The total gas oils produced in these runs have end points in the range of 875° to 900° F. These gas oils are equally suitable for recycling in a Houdresid unit, or as charge to a gas-oil cracking unit.

Processing heavy residua . . . Typical results from Houdresid processing of tar separator and heavy vacuum bottoms are shown in Table 6, which presents data on 10.6 per cent tar separator bottoms, a 10 per cent vacuum bottoms, and a 4.1 per cent vacuum bottoms from several crude sources.

Processing the 10.6 per cent bottoms from South Central Texas mixed crude results in excellent gasoline yields, with reasonable coke production. The gasoline F-1 clear octane from processing this charge stock is 93.4.

With both the 10 per cent mixed Mid-Continent, Texas and Louisiana vacuum bottoms and the 4.1 per cent South Central Texas mixed crude vacuum bottoms, good gasoline yields at octanes in the range of 90 are obtained. The coke yields are higher, as would be expected, than resulting from conventional gas-oil catalytic cracking.

However, the Ramsbottom carbon content of these charge stocks is extremely high. With charge stocks of high Ramsbottom carbon content, no difficulty was encountered in operation.

High metal concentration . . . Residua having high sulfur, nitrogen, and metal content were investigated as potential Houdresid feed stocks. Typical pilot-plant results obtained from four such stocks are given in Table 7. All of these stocks contain between 3 and 5 per cent sulfur, and from 100 to 1,100 p.p.m. of heavy metals. The nitrogen contents range from 0.3 to 0.7 weight per cent.

Once-through operation with these charge stocks results in debutanized gasoline yields of approximately 29 to 37 per cent at conversion levels in the range of 50-65 per cent. Coke yields vary from 15 to 22 weight per cent.

Recycle operation, as shown for heavy Wyoming reduced crude, results in a substantial increase in gasoline yield, the increase amounting to 17 volume per cent of charge, with only small increase in gas and coke yields.

Even with such highly contaminated charge stocks, gasoline F-1 clear octanes in the range of 90 to 92 F-1 clear are obtained. Both Ordonez and Boscan topped crude yielded approximately 2 weight per cent hydrogen sulfide, which is included in the dry-gas yield.

Acknowledgment

Acknowledgment is made of Houdry personnel contributions made by J. W. Schall, D. H. Stevenson, J. B. Maerker, and F. Walser in pilot plant and commercial development, and by R. K. Smith, J. H. Krause, T. H. Milliken, and H. Heinemann in research leading to this new process.

References

1. Burtis, T. A., Dart, J. C., Kirkbride, C. G., and Peavy, C. C., Chemical Engineering Progress, 45, 97-101 (1949).
2. The Oil and Gas Journal, 53, No. 46 (1955) 144-145.
3. Alexander, J., Proc. A.P.I., 27, III, 51, Nov. (1947).
4. Mills, G. A., Ind. Eng. Chem., 42, 182 (1950).
5. Schall, J. W., Dart, J. C., and Kirkbride, C. G., Chemical Eng. Prog., 45, No. 12, 746 (1949).
6. Maerker, J. B., Schall, J. W., Dart, J. C., Chemical Eng. Prog., 47, No. 2, 95 (1951).
7. Schall, J. W., and Dart, J. C., Petroleum Refiner, 31, No. 3, 101 (1952); and 31, No. 4, 173 (1952).

Water Flood Ups Production Sharply

A WATER-FLOOD project in Pecos County, Texas, has increased oil production to 300 bbl. a day, from 14 bbl. a day, on a lease of Carmack Drilling Co. Ultimate maximum production is expected to be 700 bbl. per day.

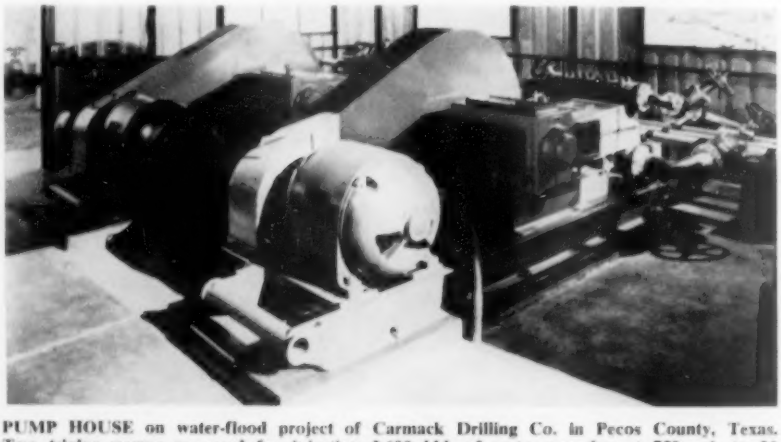
George Buckles, of Buckles & Hostetler, water-flood consultants who engineered the project, expects an ultimate recovery of 4,000 bbl. per acre.

Prior to flooding, the company was producing from 13 wells. Seven of these were converted into injection wells, and six continued as oil wells. Three more injection wells and three additional oil wells were drilled. All of the increased production is from two wells.

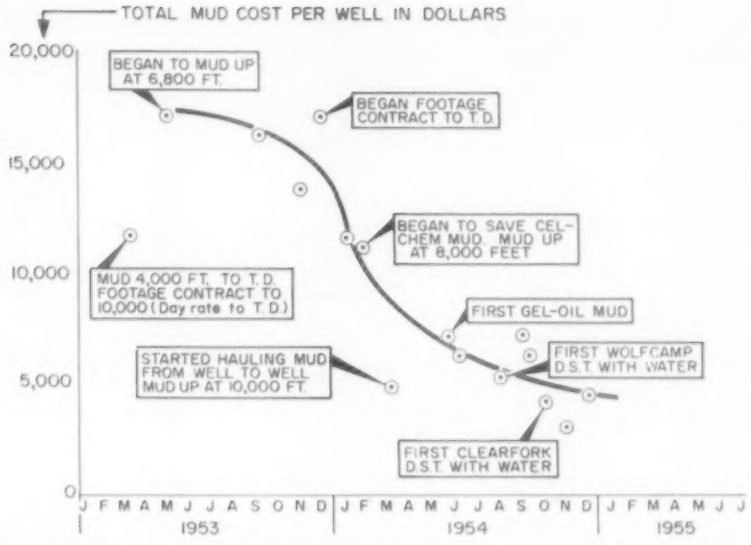
The water used is obtained at 325 ft. and is pumped to the Carmack wells and 11 injection wells of The Texas Co., on an adjoining lease, by two triplex pumps. Injection is at the rate of 3,600 bbl. a day. Water pressure, originally at 500 psi. has been increased to 750 psi., and may be raised to a maximum of 800 psi.

The Texas Co., which has 10 oil wells, has had no increase so far. Results on water flood depend on rate of injection, thickness of pay section, and how much liquid has been removed. Approximately 40,000 bbl. of water must be injected to realize any increase from the offsetting oil wells.

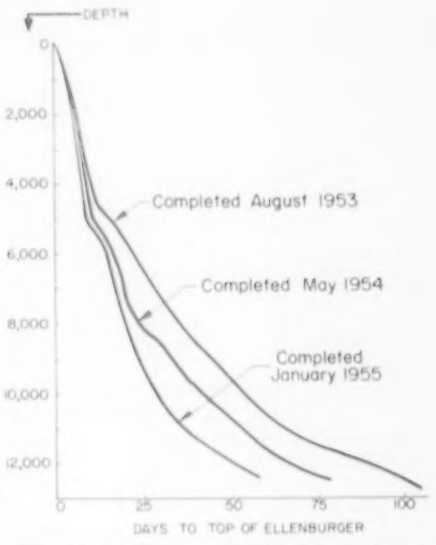
Because the water used is fairly corrosive and has considerable bacteria, it is treated with a corrosion inhibitor and a bactericide. It also is filtered through a diatomaceous earth filter.



PUMP HOUSE on water-flood project of Carmack Drilling Co. in Pecos County, Texas. Two triplex pumps are used for injecting 3,600 bbl. of water per day at 750 psi. to 21 injection wells.


TOTAL MUD COST PER WELL IN DOLLARS
20,000
15,000
10,000
5,000
0
BEGAN TO MUD UP AT 6,800 FT.
BEGAN FOOTAGE CONTRACT TO T.D.
BEGAN TO SAVE CEL-CHEM MUD. MUD UP AT 8,000 FEET
MUD 4,000 FT. TO T.D. FOOTAGE CONTRACT TO 10,000 (Day rate to T.D.)
FIRST GEL-OIL MUD
FIRST WOLFCAMP D.S.T. WITH WATER
STARTED HAULING MUD FROM WELL TO WELL MUD UP AT 10,000 FT.
FIRST CLEARFORK D.S.T. WITH WATER
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J
1953
1954
1955

MUD COST for a well drilled in Midland Farms field has been cut almost three-fourths since 1953.



DRILLING TIME for Midland Farms wells has been cut nearly 50 per cent.

In West Texas Midland Farms . . .

Drilling Is Cheaper and Faster Now

They are doing it by . . .
- . . . drilling much of the hole with water
- . . . drill-stem testing with water in the hole
- . . . salvaging mud when well is completed.

by Edwin McGhee
Gulf Coast District Editor

STANOLIND OIL & GAS CO. is setting a new drilling pattern for West Texas. This operator needed only 56 days to reach 12,700 ft. in its latest well in Midland Farms Ellenburger field of Andrews County, Texas. Wells drilled in the field less than 2 years ago took over 100 days.

Total cost of the first seven wells was about $274,000 each, but the last nine wells cost only $220,000 each.

Most of the saving is due to one thing—the drilling-fluid practice. The total mud cost itself is down to $4,000 each for recent wells although the average for the first seven wells was $14,200 each. But more important, water is the drilling fluid on much of the hole. The water and higher bit weights make drilling faster. As a result, footage rates on the drilling contracts are lower.

Stanolind also saves time on drill-stem tests by leaving the water in the hole instead of "mudding up."

Oil-emulsion mud is used to drill some sections of the wells. While it makes fishing jobs easier and reduces loss of circulation, no one can say exactly how much the oil-emulsion mud affects drilling rate. After each well is completed, Stanolind reclaims the mud and moves it to the next location for use there.

In the south end of the field, chert bits save as much as 3 days in drilling the hard, cherty Silurian and Montoya formations. The improvement comes from the fewer number of trips needed to change bits.

A young field . . . Midland Farms Ellenburger field is about 3 miles long and 2 miles wide. It now has 20 wells producing from the Ellenburger at about 12,600 ft. The drilling program is still active.

Anderson-Prichard Oil Corp. completed the discovery well in the field in September 1952. Stanolind completed its first well a few months later and now has 16 producers and 1 dry hole. Stanolind has dually completed six of its wells, five in the Wolfcamp lime at 8,400 ft. and one in the Fusselman lime at 11,900 ft.

Drilling practice . . . On field wells, Stanolind sets 13⅜-in. surface pipe in 17½-in. hole at about 250 ft. and circulates cement. Then, a 12¼-in. hole is drilled to the top of the Midland Farms Grayburg formation which is porous and often causes loss of circulation. From there, a native salt-starch-oil emulsion mud saturated with a fibrous lost-circulation material is carried to about 4,950 ft. At this depth, a 9⅝-in. protection string of casing is run and cemented with enough volume to cover the Grayburg pay. This protective string also cases off the red beds and salt-bearing formations.

Fresh water then takes the place of mud to 10,000 ft. The makeup water comes from shallow wells on the location. Generally, the drilling crews jet the pits to make room for more water once each 24 hours, or when a trip is made to change bits.

Before drilling into the bentonite

Pennsylvanian and Woodford shales at about 10,000 ft., mud replaces the water. This mud is a gel-oil emulsion or gel-chemical-oil emulsion, and it stays in service to total depth of about 12,000 ft.

At the top of the Ellenburger, the 8¾-in. hole is usually reduced and a 4¼ or 6-in. hole is drilled some 20 ft. into the pay. The operator then takes electric logs and sets casing at the top of the zone with enough cement to cover the Clearfork formation at 7,000 ft. For single completions the oil string is 5½-in. o.d.; for dual completions it is 7-in.

Use of 4½-in. drill pipe, sixteen 7¾-in. drill collars, jet bits, and high circulation rates decreased drilling time from 100 days to 82 days. Use of water instead of mud decreased drilling time even further. The latest well reached total depth in only 56 days.

Most of the drilling contractors in the field carry 60,000 lb. weight on the 12¼-in. bits and 50,000 lb. on the 8¾-in. bits.

Mud practices . . . On the first well, Stanolind drilled from 4,400 ft. to total depth with mud so that any possible pay formations could be evaluated. Information from this well showed that the second well could be drilled with water from 4,950 to 7,000 ft. and this was done. Stanolind continued to mud up to get formation samples and to drill-stem test the Clearfork (6,800 to 7,400 ft.) and the Wolfcamp (8,350 to 8,700 ft.). However, water was used to drill the section between the two zones and from the bottom of the Wolfcamp to 10,000 ft. Mud was stored in 500-bbl. stock tanks while water was in the hole.

Drill-stem testing the two upper zones with water began on the eleventh well. It is now standard practice. No special precautions are taken for the tests with water in the hole. The contractor merely circulates until the hole is clean. On the better-equipped rigs, as little as 2 hours of circulation is enough.

Now, with the success of the water on drill-stem tests, Stanolind does not mud up before reaching 10,000 ft.

Loss of circulation . . . The pay zones, especially the Wolfcamp, in Midland Farms field are erratic in their development; and formation pressures vary widely. Therefore, the mud weight is very important. For instance, where the Wolfcamp is well developed, a mud weight of 9.3 lb. per gal. will cause continued loss of fluid to the formation.

At first, Stanolind added No. 2 diesel oil and 50°-gravity Ellenburger sweet crude to keep mud weight in the range from 8.9 to 9.3 lb. per gal. However, 32°-gravity oil emulsifies more easily and remains emulsified longer. Therefore, it is added to the salt-clay-starch mud used to drill to 4,950 ft. and to the fresh-water bentonitic mud used from 10,000 ft. to total depth.

"—the mud weight is very important. For instance, where the Wolfcamp is well developed, a mud weight of 9.3 lb. per gal. will cause continued loss of fluid to the formation."

Surface mud system . . . Drilling contractors in Midland Farms have three or four steel tanks with a total capacity of 660 bbl. in their surface mud system. Mud not in use is stored in two or three 500-bbl. stock tanks. The contractors use two large-capacity pumps. One circulates mud in the hole; and the other mixes mud additives, jets the pits, and serves as standby.

Saving from mud salvage . . . After setting a string of production casing, Stanolind salvages the mud from the well. Usually, 1,000 bbl. of salt-starch-oil emulsion mud and 1,500 bbl. of gel-chemical-oil emulsion can be reclaimed and stored. The salvaged salt-starch-oil mud is used to mud up before entering the 4,600-ft. Grayburg porosity in the next well. The gel-chemical-oil emulsion is saved to mud up for drilling the bentonitic shales below 10,000 ft.

The price of hauling the salvaged mud within the field is only 30 cents per barrel.

Before the mud-salvage program began, the mud bill averaged $14,200 per well. But on the last three wells drilled, the combination of salvage, fast drilling, and use of water brought the mud bill down to only $4,000 per well.

Are emulsion muds good? . . . In Midland Farms field, oil-emulsion muds have been used on the last 11 wells. These muds probably increase the penetration rate slightly; but most of the credit belongs to water drilling fluid, high bit weights, jet bits, chert bits, and high circulation rates.

Likewise, the emulsion muds probably helped bring the number of bits used down from 140 on each of the early wells to 90 on the late wells. However, the experience gained by the drilling crews on each successive well was just as important. Weight on bit and length of bit runs are now adjusted from past experience to get the most life out of each bit.

The drilling contractors in the field like to use the oil-emulsion because it makes fishing jobs easier. Moreover, the mud eliminates some fishing jobs by preventing many cases of stuck pipe and casing. Also, the oil-emulsion mud helps prevent loss of circulation.

Getting Good Samples With Water

While drilling with water, Stanolind gets drill cuttings big enough for good sample analysis. The critical factor in recovering good samples seems to be velocity of the drilling fluid up the annulus between the drill pipe and the wall of the hole.

Stanolind's engineers believe that weight on the bit is important also. Obviously, the higher the weight on the bit, the larger the chips that will be formed. But high weight in itself is not enough to get good, big samples to the surface. If the annular velocity is too low, the cuttings will fall back. They will be ground up into much smaller pieces by the pounding action of the drill pipe against the wall of the hole.

Stanolind's experience here is that an annular velocity of about 3.3 ft. per second is critical. If velocity is much lower than this, the cuttings are too small for analysis by the time they reach the surface.

The obvious way to get the needed annular velocity is to circulate more water. Using bigger drill pipe is often better. For instance, on two Midland Farms wells circulating about the same amount of water, one recovered good samples, the other didn't. The difference was in the size of the drill pipe. The well recovering good samples used 4½-in. drill pipe; the other was using only 3½ and 4-in. drill pipe. When larger pipe is used, annular area is smaller; and, therefore, water velocity is higher.

Jet bits may possibly add a little to the original size of the cuttings. They are not, however, essential. The same applies to high bit weights. Neither is high pump pressure required except as a result of high volume pumping.

In Midland Farms field, these seem to be the things needed to get good samples while drilling with water:

1. Big drill collars, 7-in. o.d. or larger in the 8¾-in. hole.
2. Large drill pipe, 4½-in. o.d.
3. High pump volumes, about 400 g.p.m.

Acknowledgment

The author thanks J. I. Trott and O. R. Williams of Stanolind, Andrews, Tex., for their help in preparing this article.

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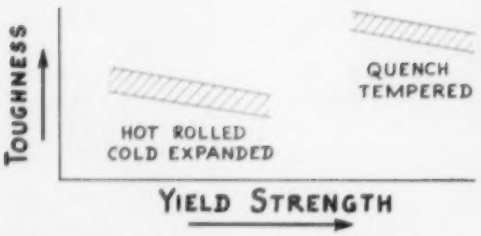
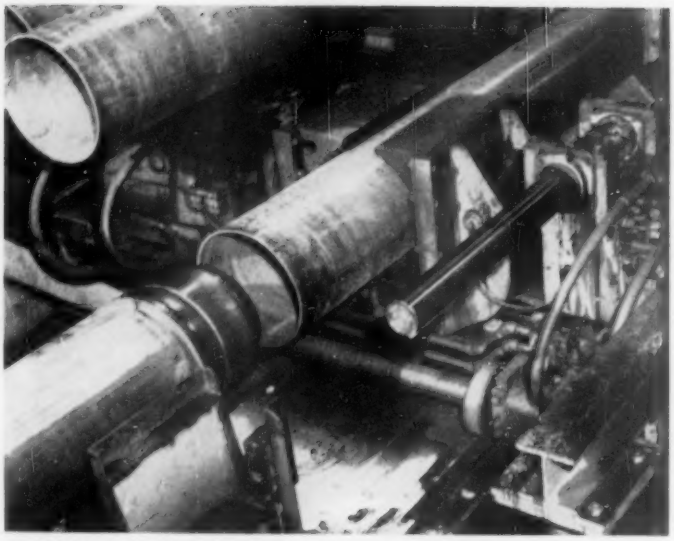


SCHEMATIC ILLUSTRATION of toughness in line-pipe steels.



EXPANDER HEAD and guide with pipe in position to be expanded. Pipe is 24-in. o.d., by .500-in. wall. Fig. 1.

The new pipe described here is proof that . . .

. . . When Stronger Line Pipe

by A. B. Wilder

THERE are two types of line pipe, seamless and welded. Seamless pipe is manufactured by piercing a hot solid round billet of steel usually by the Mannesmann process. In sizes 16 to 26-in. o.d. the pierced pipe is hot expanded in a rotary expanding mill.

Welded pipe is manufactured by electric resistance, flash, and submerged arc-welding processes. Usually a longitudinal seam is produced, although spiral welded pipe is also manufactured. Line pipe made by induction pressure-welding, butt-welding, or lap-welding process is not included in A.P.I. Standard 5LX. No attempt will be made to discuss the standard methods of manufacturing line pipe. There have been several new developments in this field which will be described.

Cold Expanded Seamless Pipe

One of the new developments in the line-pipe industry is the production of seamless cold expanded pipe in sizes 16 to 26-in. o.d. This pipe is being manufactured in the world's largest pipe mill at Lorain, Ohio.

The hot-rolled seamless pipe produced in a Mannesmann type mill from solid billets up to 12¼-in. diameter is expanded in a rotary rolling mill. After the pipe leaves the seamless hot mill, it enters a pair of cutoff machines (the first of their kind in America), which trim both ends. In these machines, instead of the pipe rotating as in conventional cutters, it is held stationary as a six-tool cutting head revolves around the end, cutting through from the outside. The new machines are controlled automatically by means of electronic devices.

The pipe is next conveyed to the cold expander, as shown in Fig. 1. Here it drops into the expander trough and one end is held firmly against a backstop. A 60-ft. ram made of 14-in. seamless pipe is positioned at the opposite end of the pipe. As expander plug is fitted on the bar cap and the ram, under 300,000 psi. pressure (1,500 hp.) forces the plug through the pipe.

The backstop opens to permit passage of the plug which drops from the bar cap onto an elevator. The elevator lowers the plug to a conveyor which carries it back to the entry end. Here another elevator raises it to an automatic aligner which again positions it for fitting onto the bar cap.

A set of five plugs is used in sequence to permit uninterrupted operations and cooling of the plugs between use. These plugs are builtup disks fitted with nickel-chrome iron alloy rings. The plugs in use on the pipe now being made are under 24 in. in diameter and 8½ in. thick. They expand the pipe to the nominal outside diameter.

Power is supplied to the ram through an electrically driven gear-reduction unit. Two heavy chains, one on each side, are attached to a crosshead to drive the ram. The plug is lubricated through a flexible pipe which feeds from a reel, through the ram and to the bar cap. Clamps which hold the pipe in the expander are operated by an oil hydraulic system at 2,000 psi. pressure.

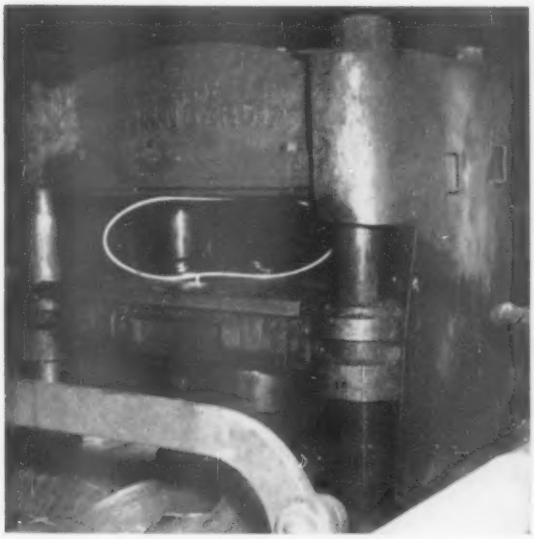
After cold expansion, the pipe enters first a rotary straightener and then is conveyed to a rotating inspection table for visual inspection. Two rings are cut from the inspected pipe. One is flattened, Fig. 2, and prepared for a standard strip tensile test to determine ultimate strength and elongation. The other ring is hydraulically tested for transverse yield strength by the ring-test method.

Pipe now being produced to A.P.I. Standard 5LX requirements has a minimum yield strength of 52,000 psi.

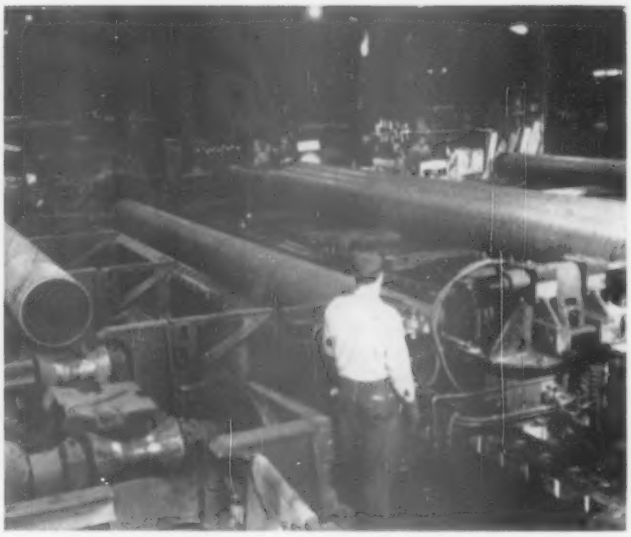
Following the ring cuts the pipe ends are beveled. The finished pipe is again inspected for surface and end flaws. Afterwards it is hydrostatically tested, Fig. 3, to pressure that exerts a fiber stress equivalent to 85 per cent of the specified minimum yield strength.

Pipe manufactured by this process is cold worked in the transverse direc-

Author is chief metallurgist, National Tube Division, United States Steel Corp., Pittsburgh.



FLATTENING TEST on 24-in.-o.d. by .500-in. wall expanded pipe. Fig. 2.



HYDROSTATIC TESTING 24-in.-o.d. by .500-in. wall expanded pipe. Fig. 3.

Is Needed . . . Pipeliners Will Get It

tion. Seamless pipe about 40 ft. long may be expanded in 60 seconds at the rate of 175 ft. per minute. Depending upon the size, seamless pipe is produced at the rate of about 50 tons per hour.

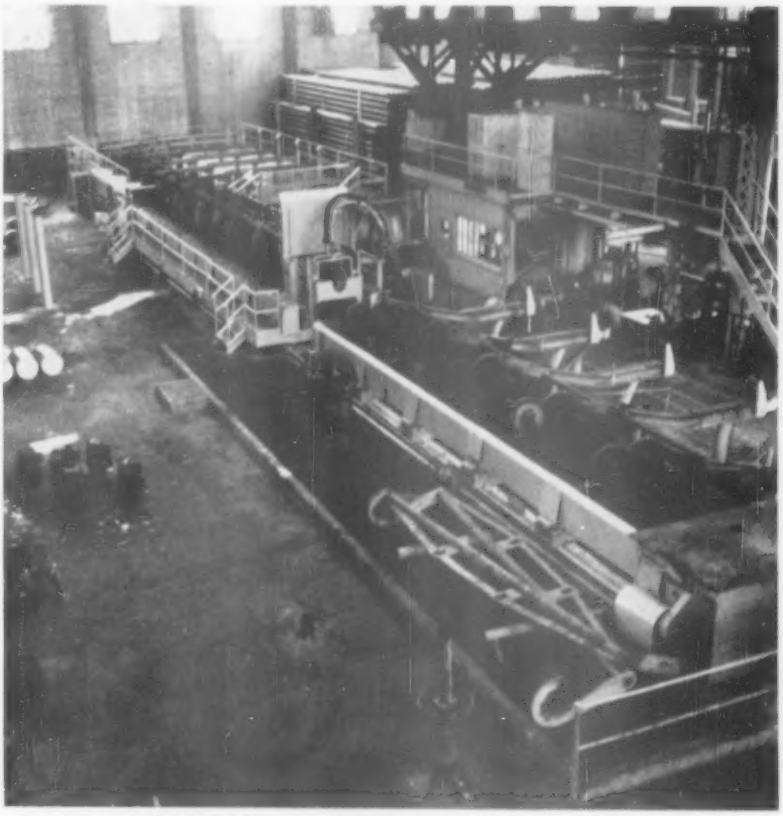
The diameter of the pipe is increased during cold working, and although a water-soluble oil is used as a lubricant, there is a temperature rise in the pipe during expansion. The pipe length is reduced about 1½ per cent, with less than 1 per cent change in wall thickness. Cold-working seamless pipe in the transverse direction increases the yield strength at least 10 per cent and the ultimate strength 3 per cent or more. Excellent transverse ductility results are obtained due to the nature of the seamless process.

Typical mechanical properties of cold expanded A.P.I. Standard 5LX, Grade X52, 24-in. o.d. line pipe based on a limited number of tests are as follows:

Yield strength, psi.	63,000
Tensile strength, psi.	80,000
Elongation in 2 in., per cent	33

T-1 Line-Pipe Steel

Another new development in line pipe is T-1 brand steel. This steel is also available in plate, bars, and semi-finished products or forgings. T-1 steel is produced in seamless sizes up to and including 10¾-in. o.d. pipe. Only a



WATER-QUENCHING equipment for T-1 steel. Fig. 4.

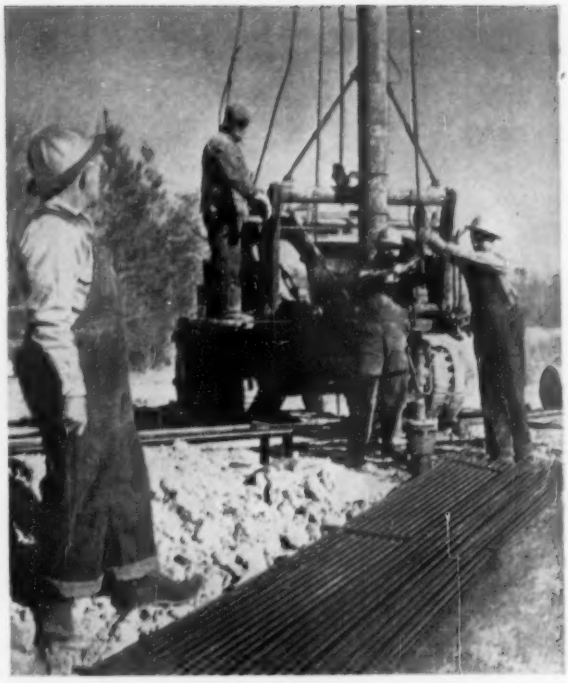
Pumping Liquid Gold in Southern Arkansas

They never lack for activity in the Hibank field, near El Dorado, Ark. In this field, and in adjacent areas, Caddo Oil Company is operating more than one hundred producing wells, in many of which Bethlehem Sucker Rods are playing an important part. The accompanying photographs show one of these wells, the Risinger No. 4, equipped with 2100 ft of Bethlehem ⅝-in. "X2" sucker rods. This well is one of a recently completed 20-well program in the field, and is now producing 41-gravity oil.

Bethlehem "X2" Rods are made of carbon-manganese steel. They are fully normalized to provide uniform mechanical properties, and are intended for medium to heavy pumping duty in generally non-corrosive wells.

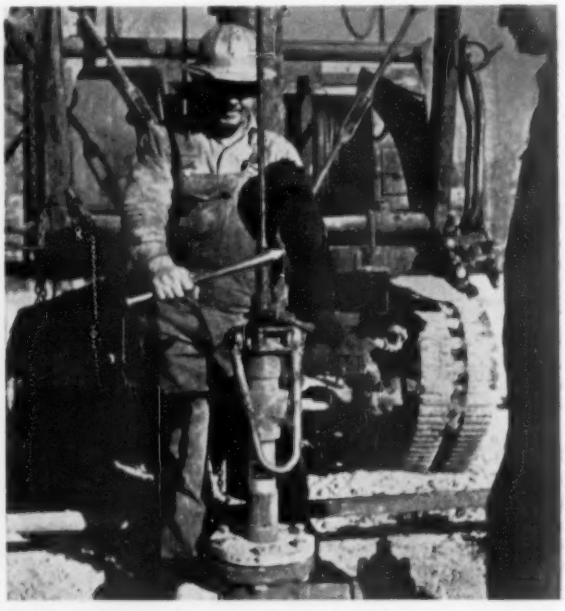
No matter what type of well condition you may encounter, you can be sure of dependable service from Bethlehem Sucker Rods. For these quality rods come in carbon and alloy steels in types to meet individual requirements. For details, your sucker rod distributor is as near as your telephone. Or get in touch with the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.



Running the rods. Using servicing unit, workers guide Bethlehem "X2" rod into place. A Bethlehem unit package, which can contain 80 or 100 rods, is shown opened in foreground. It saves time, and prevents rod damage.

D. A. Raymond, Jr., president of Caddo Oil Company, studies Bethlehem pumping unit. This well has pumped with original equipment since completed in October, 1950.



Using snap wrenches, joint is checked for tightness. Bethlehem "X2" rods were used as Risinger No. 4 well pumped 41-gravity oil from 2100 ft.

BETHLEHEM *Sucker Rods*

BETHLEHEM STEEL

limited amount of T-1 steel has been experimentally produced in line pipe and no pipelines have been laid with this new material. The steel has the following typical composition in per cent.

C	Mn	P	S	Si	Ni	Cr	Mo	V	Cu	B
0.15	0.75	0.025	0.030	0.25	0.85	0.50	0.45	0.05	0.30	0.003

There are two levels of minimum mechanical properties available in line pipe which, based on a limited number of tests, are as follows:

Yield strength, psi.	90,000-105,000
Tensile strength, psi.	105,000-120,000
Elongation in 2 in. (1½-in. gage width), per cent	18-16

Easily welded . . . The steel is weldable in the field without preheat or postheat, and when welded with American Welding Society 12015 electrodes has a 100 per cent joint efficiency. The joint efficiency is based on removal of excess weld metal. With this low-hydrogen electrode it may be necessary to uphill-weld pipelines. Experiments are being conducted with girth welding to determine the most satisfactory practice.

The toughness characteristic, as measured by the Charpy keyhole impact ductility transition temperature at 15 ft.-lb. in the longitudinal direction, is —150° to —250° F. (Editor's note: Its toughness is indicated by the fact that it resists notch failure down to temperatures in the range of —150° to —250° F.) Ordinary high-strength line-pipe steels have a transition temperature above 0° F.

In ordinary pipeline steels much attention is given to the per cent elongation of a 2-in. gage length in the tensile heat. The elongation characteristics of T-1 steel are lower than those of ordinary high-strength line-pipe steels. The reduction-in-area in a round tensile test specimen of T-1 steel is similar to high-strength line-pipe steel.

Tougher . . . In T-1 steel a new concept of toughness is introduced. The toughness of low-carbon tempered martensite exceeds the toughness characteristics of ordinary high-strength line-pipe steels. This superior quality of T-1 steel is due to the microstructure obtained on heat treatment and depends upon quenching to martensite with essentially no free ferrite in the structure. This structure should be less susceptible to failures associated with mechanical notches and metallurgical defects than the metallographic structures obtained in Grade X52 hot-rolled line-pipe steels. The low-carbon martensites are less susceptible to cracking during quenching. And with the use of a low-hydrogen electrode in welding, the influence of hydrogen on underbead cracking is almost removed.

Seamless pipe can be manufactured from T-1 steel by piercing and rolling on conventional seamless mills. The hot-rolled pipe is heat-treated in a continuous unit by water quenching from 1,650° F. and tempering at 1,000°-1,200° F. A series of barrel-type, gas-fired furnaces are used for heating the pipe. Rotation of the pipe during heating and quenching is important with respect to uniformity and straightness of the product. After heating to 1,650° F. the pipe is quenched with a specially designed water spray ring consisting of nozzles. The total length of the 7-bbl. continuous furnace is 47 ft. and the rate of heat treatment, depending on pipe sizes, is 5 to 20 ft. per minute. The capacity of this unit is being changed by adding additional barrels for heating. The pipe material is quenched to martensite and immediately tempered.

Tempering Furnace

Immediately after quenching the steel pipe is placed in a tempering furnace. Here it is heated in a 50-minute cycle to the tempering temperature of 1,000°-1,200° F., depending upon the properties desired. The furnace is shown in Fig. 5.

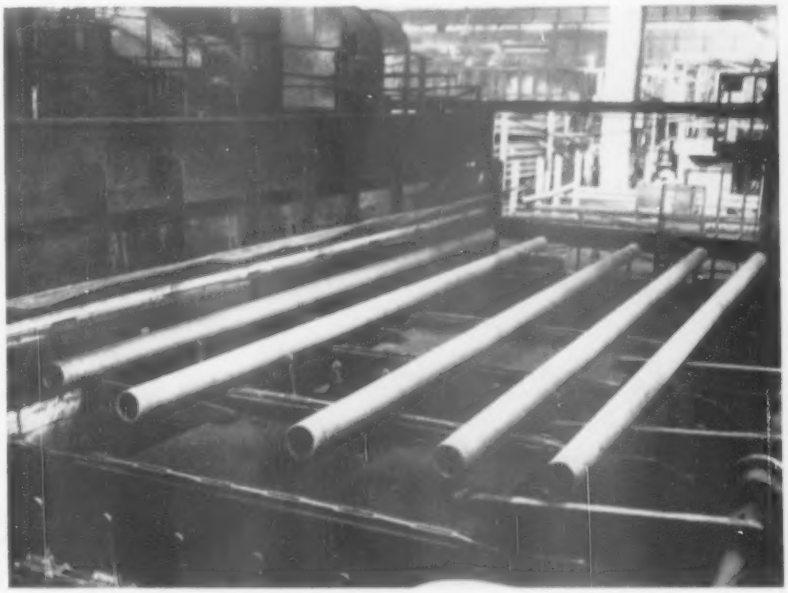
The pipe is rotated during heating in a roll-down-type furnace to maintain straightness and uniform heating. The continuous tempering furnace is fired with gas and the pipe temperature as it leaves the furnace is measured with a Rayatube.

After heating to the tempering temperature, the pipe is passed through a set of five stands of sizing rolls. This is to insure proper size as an increase of about 1/32-in. o.d. occurs during quenching. Also the pipe becomes slightly oval and crooked. The sizing operation insures uniform size in the quenched and tempered product.

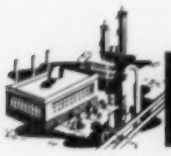
The sizing operation must be limited as it would influence the transverse properties of the pipe by developing compression stresses. Usually the longitudinal tensile test is employed for smaller size pipe. However, the hydraulic ring expansion test may also be used for determining the yield strength. In this latter case it would also be necessary to determine the transverse tensile strength or use the longitudinal tensile strength.

Other Line-Pipe Steels

Additional line-pipe steels being developed are in the early experimental stages and cannot be discussed at this time since significant data is not available. These steels are being developed with a knowledge that economic factors limit the use of materials in pipelines. However, the need for new and better steels exists, particularly in densely populated areas, compressor stations, and under various climatic conditions. We are conducting the necessary experimental work to produce the steels which we feel will be required in the future.



TEMPERING furnace for T-1 steel. Fig. 5.



THE FOREMAN'S PAGE

Refining · Petrochem · Natural Gasoline

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—3

How Pressure Acts on Fluids at Rest

FOR our purposes here, the term fluid is used to designate both liquids and gases. These two substances have many properties that are identical. For example, each is very active or movable. In fact, they are so active or free to move that they don't have any definite shape. They take the shape of the vessel that may contain them.

In our process operations we constantly deal with fluids and the equipment used in moving or storing them. So let's take a look at the practical application of the laws and principles which govern the action of fluids at rest. We'll consider the principles which govern fluids in a future article.

Q. What's the difference between force, weight, and pressure?

A. Force means a push or pull. Weight means heaviness. And pressure means the push or pull or weight per unit area of the surface acted upon. Pressure can be defined as:

$$\text{Pressure} = \frac{\text{Weight}}{\text{area acted upon}} \text{ or}$$

$$\text{Pressure} = \frac{\text{Force}}{\text{area acted upon}}$$

Material taken from training program notes, Esso Standard Oil Co., Baton Rouge, La., refinery.

To help understand the difference between weight and pressure, suppose we have the three blocks shown below laying on a table top. Each block weighs exactly same amount. However, the amount of pressure produced on the table top by the blocks depends on the way the block is placed on the table top or the shape of the block. In Fig. 1, the block weighing 10 lb. would exert a pressure of 5 psi. and in Fig. 2 the same 10-lb. block would exert a pressure of 10 psi. To make the point more drastic, suppose we had a 10-lb. block shaped as shown in Fig. 3.

Since Pressure $= \frac{\text{Weight}}{\text{Area}}$. Then the pressure exerted by the block would be $\frac{10}{\frac{1}{2} \times \frac{1}{2}} = 40$ psi.

Q. Do all fluids (liquids and gases) have weight?

A. Yes. Water weighs 62.4 lb. per cu. ft. Air at atmospheric pressure and 60° F. weighs 0.076 lb. per cu. ft. Hydrogen, the lightest gas known, weighs 0.0053 lb. per cu. ft. You can verify this easily by weighing a nitrogen or oxygen cylinder before and after emptying the cylinder.

Q. Why is the pressure exerted by a fluid in a vessel independent of the shape of the vessel?

A. Well, look at the following example where two tanks of different shapes are filled with water to the same height. Notice how the pressure gages in Figs. 4 and 5 indicate equal pressures since they are located at the same elevations on the tanks. That's because the pressure exerted by a liquid at any given point or location in a vessel depends not on the shape of the vessel but upon the height of liquid above it.

For example, suppose we are pressure-testing two fractionator towers with water. The towers have been filled with water and we have pressure gages located on the towers as shown in Figs. 6 and 7. If the towers are filled with water, the pressure obtained on the top pressure gage would read zero. But since each foot of water height will produce a pressure of 0.433 psi., the second pressure gage from the top would read $28 \times 0.433 = 12.2$ psig. The third pressure gage from the top would read $68 \times 0.433 = 29.5$ psig. And the bottom gage would read $90 \times 0.433 = 39.1$ psig. Note that the pressure gages on each fractionator tower would read identical pressures even though the shapes of the containers are different.

Another good example of a pres-

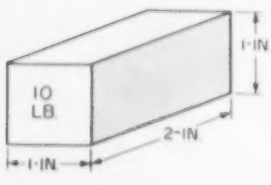


Fig. 1

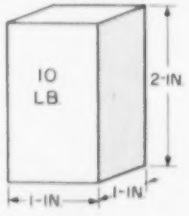


Fig. 2

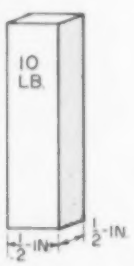


Fig. 3

SAME WEIGHT, DIFFERENT PRESSURE. All three of the above blocks weigh 10 lb. each. But Fig. 1 exerts a pressure of 5 psi., Fig. 2 exerts 10 psi., and Fig. 3 exerts 40 psi. The area of the block at its base makes the difference because pressure is the weight on a given square inch of area.

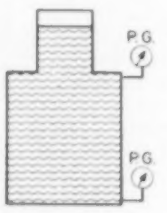


Fig. 4

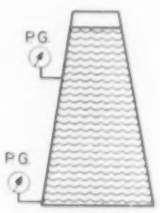


Fig. 5

SAME PRESSURE, DIFFERENT SHAPES. Pressures at the base and top of Figs. 4 and 5 are the same at each height. Here shape makes no difference.

sure buildup that depends upon the height of operating equipment is the catalyst standpipes at our catalytic cracking units. These standpipes are used to transfer regenerated catalyst from a regenerator vessel which operates at about 7 psig. to a reactor vessel operating at about 20 psig.

The pressure in these standpipes builds up from the top to the bottom of the standpipe just as it did in the water in the fractionating tower—even though in this case the fluid handled is an aerated solid. This solid when fluidized behaves the same way a fluid does. But when the standpipe is in operation, the fluidized catalyst does not weigh as much as an equal volume of water would weigh. So the pressure buildup produced by each foot of height above the point at which the pressure is determined is less than that produced by water.

Below you'll find some weights of fluid per cubic foot of volume, along with the corresponding pressure buildups which will be obtained for each foot of height above the point at which a pressure is determined:

Fluid—	Weight per cu. ft. (lb.)	Pressure buildup per foot of height (psi.)
1. Aerated catalyst in S.P.	45.0	0.305
2. Water	62.4	0.433
3. Mercury	840.7	5.90
4. Gasoline	47.0	0.327

Q. What determines the pressure resulting from an external load?

A. The final or total pressure exerted at any given point in a vessel, pump, line, etc., will depend upon the head or weight of liquid being handled **plus** any external pressure being exerted on the liquid being handled. For instance, suppose we had a vessel like that in Figs. 8 and 9 filled with water to a height of 20 ft. If the vessel is open to the atmosphere, the pressure indicated by a pressure gage located at the bottom of the vessel would be 20 × 0.433 or 8.66 psig. Now suppose we close the opening in the vessel and add pressure with a compressed gas so that the pressure gage at the top of the vessel reads 200 psi. Then to determine the pressure at the bottom of the vessel, we would have to add the pressure produced by the water to the pressure produced by the compressed gas. We would find that the pressure gage located at the bottom of the vessel would read 208.6 psi.

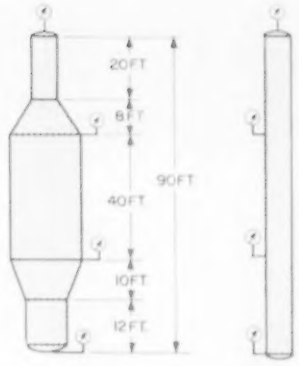


Fig. 6 Fig. 7

SHAPE MAKES NO DIFFERENCE. Despite the difference in shape of the towers in Figs. 6 and 7, pressures are the same at similar heights.

Q. How is pressure in liquid transmitted?

A. Pressure in a liquid is exerted equally in all directions. Study Fig. 10. If the box were filled with water to a height of 10 ft., then the pressure would be 10 × 0.433 or 4.33 psi. at the bottom. If the tubes were then also filled with water, the total pressure at the bottom of the box would be 20 × 0.433 or 8.66 psi. What would be the pressure shown on the gage at the top of the box? The example on the previous page is used to demonstrate that pressure is transmitted equally to all portions of a liquid.

In our operations this principle is utilized to operate hydraulic valves and hydraulic presses. An even more common example is the pressurizing of lines and vessels by reciprocating and centrifugal pumps.

Q. What is the difference between absolute pressure and gage pressure?

A. The gage pressure ("psig." for "pounds per square inch gage") is the difference between a given pressure and that of the atmosphere. It is the pressure actually read on a pressure gage. The sum of the gage pressure and the atmospheric pressure equals the absolute pressure ("psia." for "pounds per square inch absolute").

Thus if a gage reading is 50 lb. per sq. in., then the gage pressure is 50 psig. and the absolute pressure is 50 plus 14.7 (the pressure of the atmosphere) making the absolute pressure 64.7 psia.

Now we can have **positive** pressure or **negative** pressure. If the pressure gage reads zero then we have atmospheric pressure. If it reads above zero the pressure is of course positive. When we have a vacuum (that is, a pressure less than atmospheric) we call that negative pressure and read it on a vacuum gage. A compound gage can read positive pressure or vacuum or both.

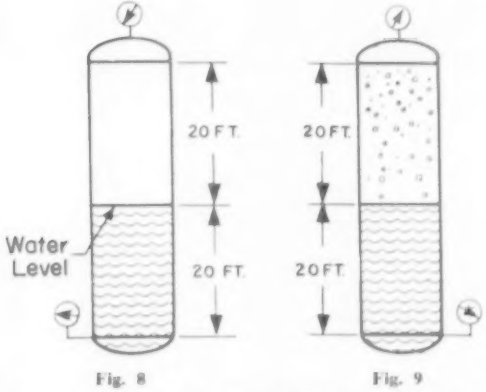


Fig. 8 Fig. 9

LIQUID HEAD PLUS GAS PRESSURE. Figs. 8 and 9 differ in pressure levels at their bases because Fig. 9 is subjected to the added pressure of gas above the water in a closed container.

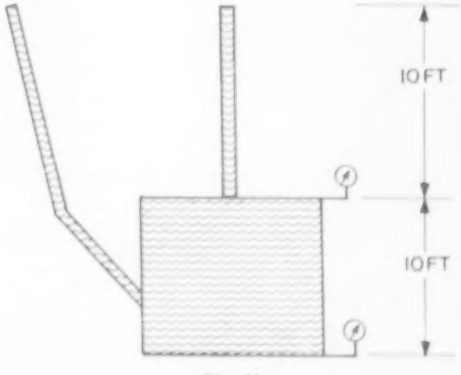
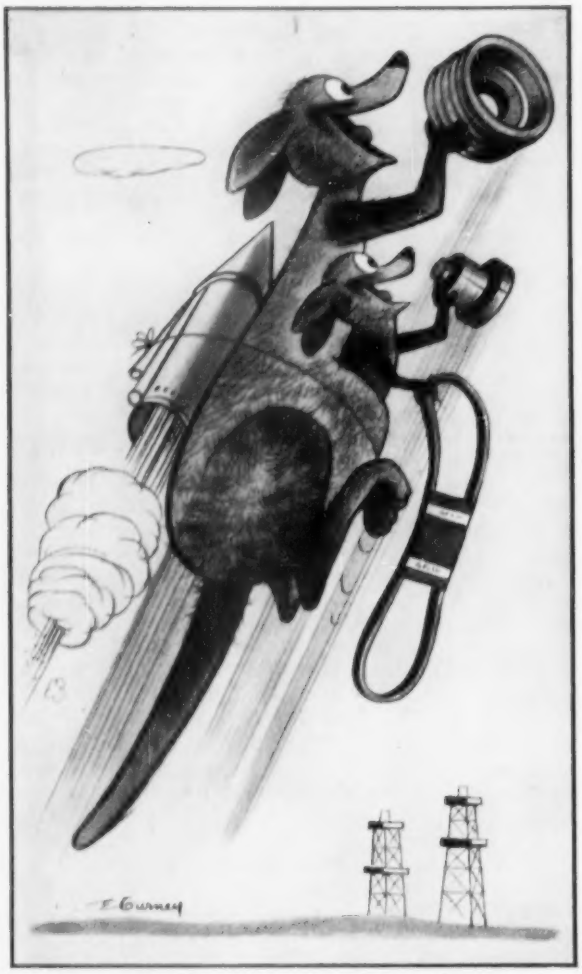


Fig. 10

PRESSURE IS EXERTED EQUALLY. In any liquid, pressure is exerted equally in all directions. For example, in Fig. 10 above, the same pressure is exerted in the side arm as in the box at the same height.



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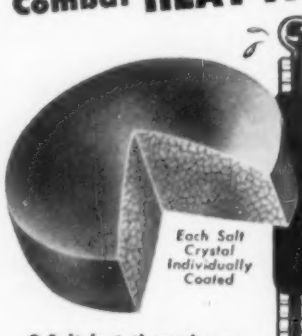

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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Allowable Sulfur Content of Metallurgical Coke

"How much sulfur can be tolerated in a metallurgical coke that will be used for steel manufacture?"—M.H.G.

According to current specifications, the allowable sulfur content of petroleum coke is about 0.5 per cent, but this value seems to be lower than necessary because the coal cokes that are used in iron manufacture contain 0.6-1.2 per cent of sulfur (average above 0.74).

The allowable sulfur content of the coke can be estimated (or computed if adequate analyses are available) by means of a sulfur balance of the materials entering and leaving the blast furnace:

$$S_c = \frac{S_i - aOS_o - aFS_f}{aC}$$

in which:

S = per cent sulfur (subscript indicates material)
a = fraction of sulfur that appears in the iron
C = tons coke per ton iron
O = tons ore per ton iron
F = tons flux per ton iron
i = refers to iron

H. W. Graham, in his "Behaviorism of Elements in Iron and Steel Making," Metal Progress, Jan. 1952, p. 87, states that about 3 per cent of the sulfur in the raw materials appears in the iron:

To flue gas	nil
To flue dust, per cent	1
To slag, per cent	96
To pig iron, per cent	3

Other sources indicate, under favorable conditions, percentages as low as 1.0. If the basic ingredients per ton of iron are:

Ore, tons	1.5
Coke, tons (petroleum)	1.1
Flux	0.73

and if 3 per cent is accepted as a suitable retention of sulfur, the basic formula becomes:

$$S_c = \frac{S_i - 0.045\,S_o - 0.022\,S_f}{0.033}$$

In order to use the formula, the sulfur contents of the various ingredients must be known (see Table 1).

TABLE 1—INDICATION OF THE SULFUR CONTENT OF IRON INGREDIENTS

	Per cent S
Pig irons:	
For Bessemer steel	0.02-0.05
For basic open-hearth steel	0.02-0.05
For cast-iron foundry	0.02-0.06
For charcoal steel	tr.-0.03
Ferromanganese	0.01
Spiegeleisen	0.01
Silicospiegel	0.04
Ferrosilicon	0.05
Ferrophosphorus	0.01
Typical fluxes:	
Ordinary limestone	tr.-0.2
Special	tr.-0.12
Dolomite	tr.-0.2
Ores:	
Lake Superior hematite (Marquette)	0.019
Lake Superior hematite (Gogebic)	0.003
Lake Superior hematite (high Si)	0.029
Adirondack magnetite	0.04
Alabama hard (carbonate)	0.07
Alabama soft red	0.07
Alabama brown	0.07
Blast furnace slags:	
With acid Bessemer iron	1.0 -2.0
With basic open-hearth iron	1.0 -2.0
With charcoal iron	0.5 -0.3
Ferromanganese	1.25-2.5
Ferrosilicon	1.0 -1.5
Spiegel	1.0 -2.0

TABLE 2—ALLOWABLE SULFUR CONTENT OF PETROLEUM COKES

Coke, allowable per cent S	Quality of iron and raw materials	
	Iron, per cent S	Raw materials
0.03	0.01	highest sulfur
0.21	0.01	lowest sulfur
0.64	0.03	highest sulfur
0.81	0.03	lowest sulfur
1.54	0.06	highest sulfur
1.72	0.06	lowest sulfur

By inserting appropriate extremes from the analyses of Table 1, it is found that the percentage of sulfur in petroleum coke can range up to even 1.5 per cent rather than the 0.5 per cent found in specifications. Allowable sulfur contents are indicated in Table 2. Even higher sulfur contents in the coke can be allowed if the retention of sulfur is lower than the 3 per cent used here. The elimination of sulfur in the blast furnace can be improved by using a larger amount of slag, maintaining a more fluid slag by additions of fluorspar or calcium chloride, maintaining more manganese in the slag, and operating the blast furnace at a higher temperature.

Engine-Cleaning Fuel

"I have heard of a new method of cleaning car engines which depends on burning a special fuel. Can you direct me to the new method?"—M.S.W.

So many gasoline additives are now being discussed or marketed that the meaning of the question is not clear. However, it may refer to the new carbon removal method of Sigworth & Stone, California Research Corp. (Controlling Preignition by Deposits Removal, S.A.E. summer meeting, Atlantic City, June 10, 1954.)

The so-called PDQ carbon remover of Sigworth & Stone is a special fuel which removes carbon deposits as it burns. The regular fuel line to the carburetor is disconnected and blanked off, and the special fuel is admitted to the carburetor by gravity flow. The fuel is supplied in disposable containers of just the right capacity for the carbon-removal treatment. The engine is quickly accelerated to 3,000 r.p.m. and then allowed to idle. Repetition of the acceleration and idling for about 30 times completes the treatment.

No indication of damage to the engine has been reported, and it is thought that the treatment reduces the octane requirement of the engine and increases the power output. During treatment (1) higher chamber temperatures are attained and part of the deposit is burned, (2) autoignition occurs and the resultant high-velocity pressure waves are thought to loosen the deposits from the walls, and (3) swirling of particles of deposit in the chamber are thought to "sand blast" the walls loosening the final traces of carbon or deposits. California Research Corp. has conducted an extensive investigation of the use of the method.

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MANUFACTURERS OF THE FAMOUS Racebilt LINKLOK IRRIGATION PIPE

by R. L. Dockendorff

DRY INSTRUMENT AIR—9

INSTRUMENTS

What Humble Learned About Air-Drying Equipment

DESPITE the merits of permitting only clean, dry air to reach process instruments, it is even more vital that compressed air of some quality be available at all times. To protect process units against a line-break or other failure in Baytown's tenuous dry-air distribution system, one interconnection with the yard air system was installed at each major unit.

Various types of jumpovers were installed. But all had these features in common:

1. Knockout pot on yard air in jumpover line.
2. Pressure-control valve to open when instrument header pressure drops below a given value.
3. Check valve against backflow into yard air.
4. Check valve against backflow from within unit to outside dry-air header.

In some cases, existing unit dryers were kept in place and piped into the jumpover. An example of a typical jumpover is shown in Fig. 15.

Materials

Materials and equipment items which have given good service at Baytown are:

Piping . . . Galvanized steel for all headers and laterals.

Dryers . . . Activated alumina dryers with regeneration by internal heating coils of KA_2S pipe (½ in.) with welded-on carbon-steel or alloy-steel fins; two 2,500-lb. twin-cell units and one 1,500-lb. twin-cell unit. Elsewhere in the refinery are another 750-lb. twin-cell unit, with galvanized steel coils and a silica-gel dryer with regeneration equipment entirely external to the beds. All have 8-hour process-regeneration cycles, with heating by 150-lb. steam to bed temperatures of about 150°-250° F., followed by water cooling to 100°-120° F. using the same coils.

Regeneration is manual for the alumina dryers and automatic for the silica-gel units. This resulted from an exercise of local preference among the operators. The additional cost for automatic operation probably cannot be justified for units on an 8-hour cycle. Spare charges of alumina and silica gel are kept in the warehouse at all times.

Filters . . . Oil filters are those recommended by the manufacturer to precede his dryers. For Baytown's alumina dryers, the prefilters contain either 100 or 200 lb. of alumina in a removable cartridge. A drain at the bottom permits discard of accumulated lube and any other contaminant that can be trapped out of the air to the dryers.

A square cartridge was obtained for each filter and is kept nearby to facilitate replacement and servicing at regular intervals. The cleanable-element dust filters located after the alumina-filled dryers containing porous-stone elements have given excellent service. This was despite one broken element which permitted some getaway of desiccant fines before it was discovered. Fig. 13 (Instrument 8) shows an installation of both types of filter.

Dew-point recorders . . . The dew point of the air from each dryer is recorded by a continuous-dew-point instrument. To measure dew point, this instrument employs a saturated salt solution containing two electrical conductors. With a constant voltage across the conductors, the current flow varies with the conductivity of the salt solution. In turn, conductivity is related to the moisture content.

As the humidity of the air around the cell increases, the solution will tend to absorb water. This raises the conductivity so that more current flows through the solution. The increased current flow raises the temperature of the solution until an equilibrium is reached among the solution temperature, conductivity, and moisture content. By measuring the temperature, the dew point of the surrounding air can be determined.

This instrument measures and records the dew point at operating pressure, rather than the atmospheric dew point. This is desirable since it represents the temperature at which condensation can begin in

Author is with the engineering division, Humble Oil & Refining Co. at Baytown, Tex. Paper presented at Texas A. and M. process instrumentation symposium at College Station, Tex., January 25-28, 1955.

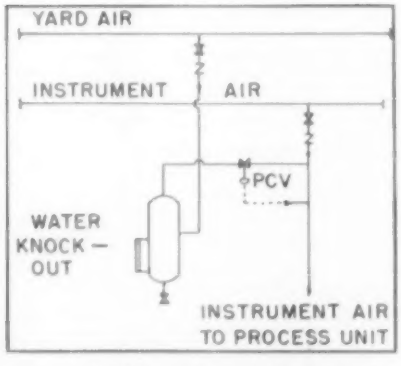


FIG. 15—Typical yard-air supplement to instrument air at the process unit.

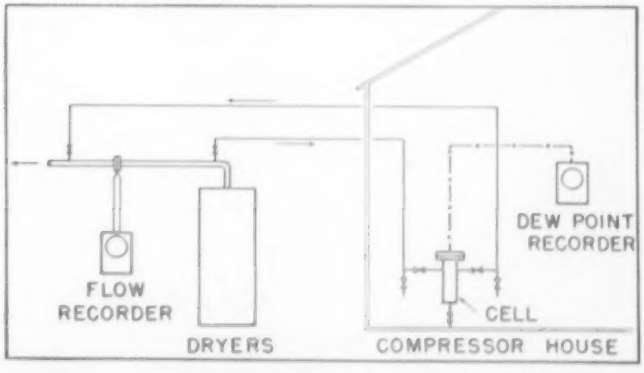


FIG. 16—Here's how dew-point apparatus is installed in and adjacent to a compressor house at Humble's Baytown refinery.

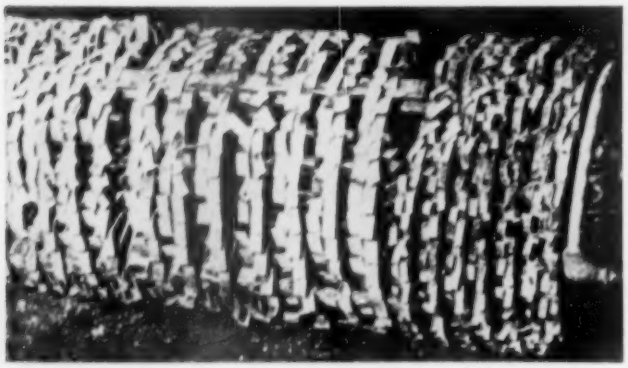


FIG. 17—Here's a view of a finned heating coil that failed, taken after its removal from the dryer.

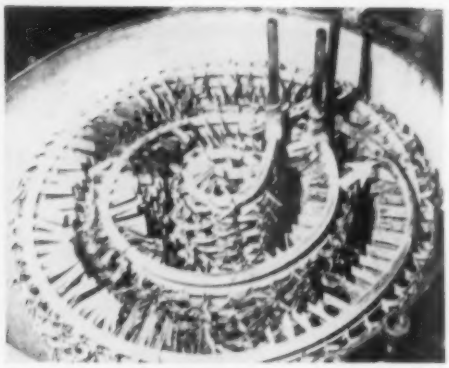


FIG. 18—This is a heating-oil nest in p'ace in the dryer, with alumina removed.

the air-distribution system before pressure reduction for instrument use.

Limitation . . . One limitation of the measuring system should be pointed out. When the relative humidity of the air is very low, the salt solution will lose all of its water and cease to conduct current. When this point is reached, the instrument responds only to changes in air temperature and not to dew point. The process is reversible so that when the humidity of the air increases, the cell will again begin to measure dew points. The manufacturer's rating information indicates that our instruments should measure dew points under practically all conditions we may encounter.

The installation of the dew-point recorders is shown in Fig. 16. An air sample is taken from the main line upstream of the flow-measuring orifice, passed through the cell, and returned to the line downstream from the orifice. Two of the three instruments are equipped with alarms set to blow a whistle when the dew point exceeds a set value. The set values for the two alarms are dew-point values of 60° and 82° F. There has been no incentive to reset these alarms to match seasonal variations in ambient temperatures since the dryers have some excess of capacity.

Cycles . . . The 8-hour cycle lengths in practice have proved to be well within the capacity of the regeneration equipment in all cases. The heating time to maximum temperature varies from 2 to 3 hours, and cooling can be done in 1 to 2 hours, leaving considerable leeway. The maximum temperature (250° F.) has been high enough to give sufficient dryness and to permit 1 to 2-year life of the alumina.

Although some of the dryers came equipped with small blowers to supply a regeneration purge stream of atmospheric air, these have not been needed. Instead, a slip stream of dried air is diverted through a unit on regeneration; this stream has hardly exceeded 3 to 5 per cent of the normal throughput. Displacement is about all that is required provided there is an internal source of heat.

Life of bed . . . Life of the alumina has varied from 1 to 2 years, averaging about 1.5 years. The practice has been to open and inspect each dryer cell on a yearly schedule. If the bed appears discolored from lube contamination or if the drying of air has become inadequate, the alumina is changed. Otherwise, the bed is retained for another year.

Prefilter . . . Keeping the dryer prefilter in good shape is vital to the success of the operation for more than one reason. The accumulated oil, if allowed to wet the filter cell entirely, will eventually come through and lay down on the dryer bed. Lube contamination reduces the capacity of the bed to take up water, and is not corrected by regeneration.

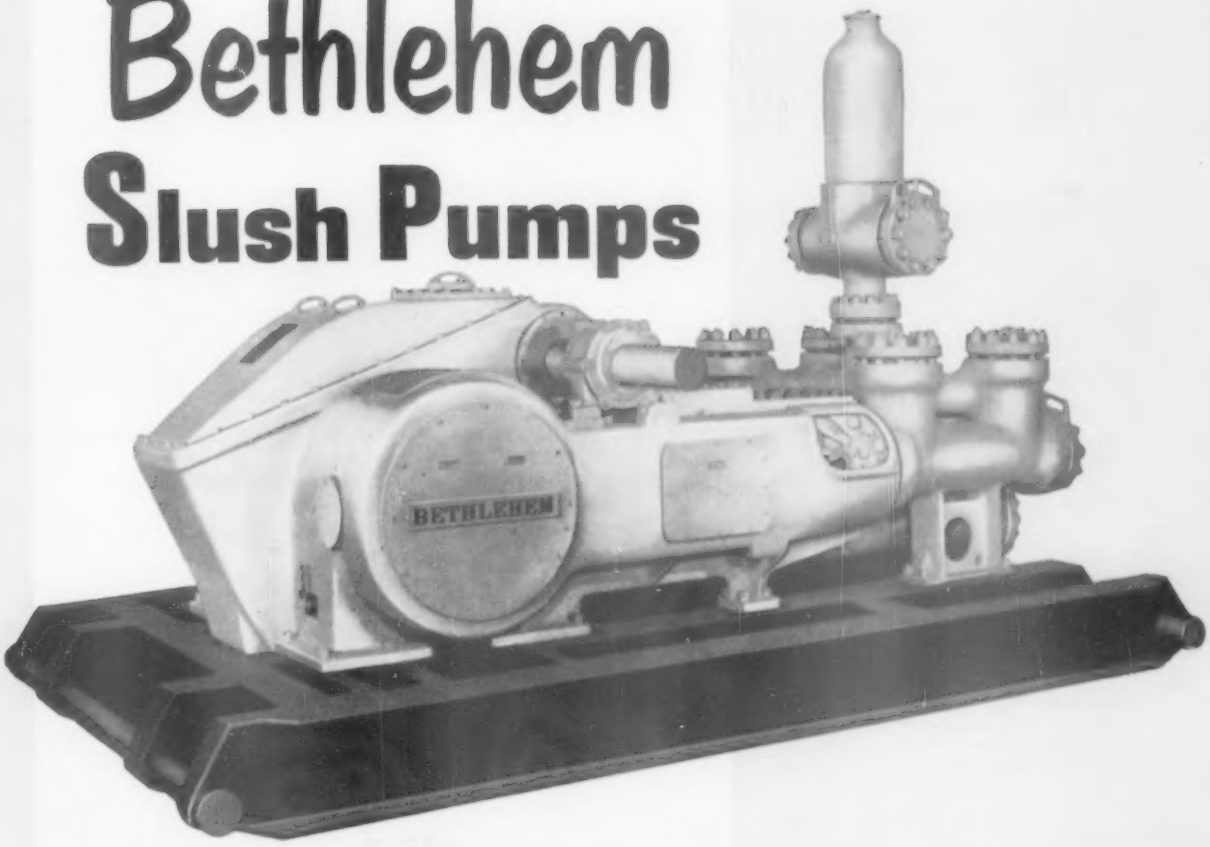
A regularly scheduled swapout or naphtha-cleaning of filter cartridges therefore is mandatory. The proper frequency is related to compressor operation, and can only be determined by trial. From 1 to 3 months is about par. Baytown has found its oil filter also trapping out additional water condensate, particularly during periods of cold weather when line cooling is considerable. The advantage of this is obvious.

Excess water . . . Both dust and water at times have penetrated well down the line due to faulty equipment or operation. The broken filter element has been referred to above. The principal sources of excess water in the instrument air lines have been (1) bed channeling, (2) steam-coil leaks, and (3) faulty interconnection with other lines. None of these has been much of a factor since early days of operation of the system.

Finned coils . . . A certain amount of skill was needed in packing alumina around the finned coils; some beds were repacked two or three times before a satisfactory result was attained. The bed removals in turn had been required when steam coils originally furnished with the dryers sprung leaks within 2 months operation. Coils at that time were of galvanized steel, and were identical to others in a unit that had operated for 2 years without evidence of undue corrosion in another part of the refinery. It was concluded that the steam must be more corrosive in one area than the others, and that in view of the uncertainty very high-grade replacement coils could be justified. The replacement was with stainless steel, and there has been no further trouble to this date.

Fig. 17 shows a view of one of the coils which had failed, after removal from a dryer. Fig. 18 shows the assembled coils in place before replacement of the alumina. The corrosion failure was localized pitting on the steam side and does not show in the photo. Some flaking-off of the galvanizing was noted on the outside in contact with the alumina, principally at the air-inlet part of the coil where liquid water possibly might collect (Fig. 18).

Bethlehem Slush Pumps



...the pumps with preloaded main bearings

It's probably no news to you that Bethlehem makes slush pumps, a full line capable of meeting every drilling need. But have you ever studied these units — really studied them? Looked inside to see what makes them tick?

For instance, did you know that Bethlehem pumps are equipped with *preloaded* main bearings? That's a real feature! Preloaded bearings eliminate shaft play and float, and withstand even severe load reversals.

The type used in Bethlehem pumps are extra-large, with extra-high capacity; hence you can always rely on them for long life and freedom from trouble.

Incidental benefit: maintenance requirements are *very* low.

Needless to say, there are other features that make these pumps outstanding performers. Examples: massive, rugged, all-steel fluid ends, which are able to withstand the highest pressures ever encountered . . . complete oil-bath lubrication . . . roller bearings throughout . . . A.P.I. metal ring gaskets on valve covers, suction flanges, discharge flanges, stuffing boxes.

Bethlehem pumps will slug it out with the toughest jobs you care to name. Details are available from any Bethlehem office, and we'll be glad to furnish them at your request.

Five Sizes of Bethlehem Slush Pumps

Model	Input Hp	Bore & Stroke, In.
H-150	220	7¼ x 12
225	300	8 x 14
325	400	8 x 16
450	600	8 x 16
600	750	8 x 18

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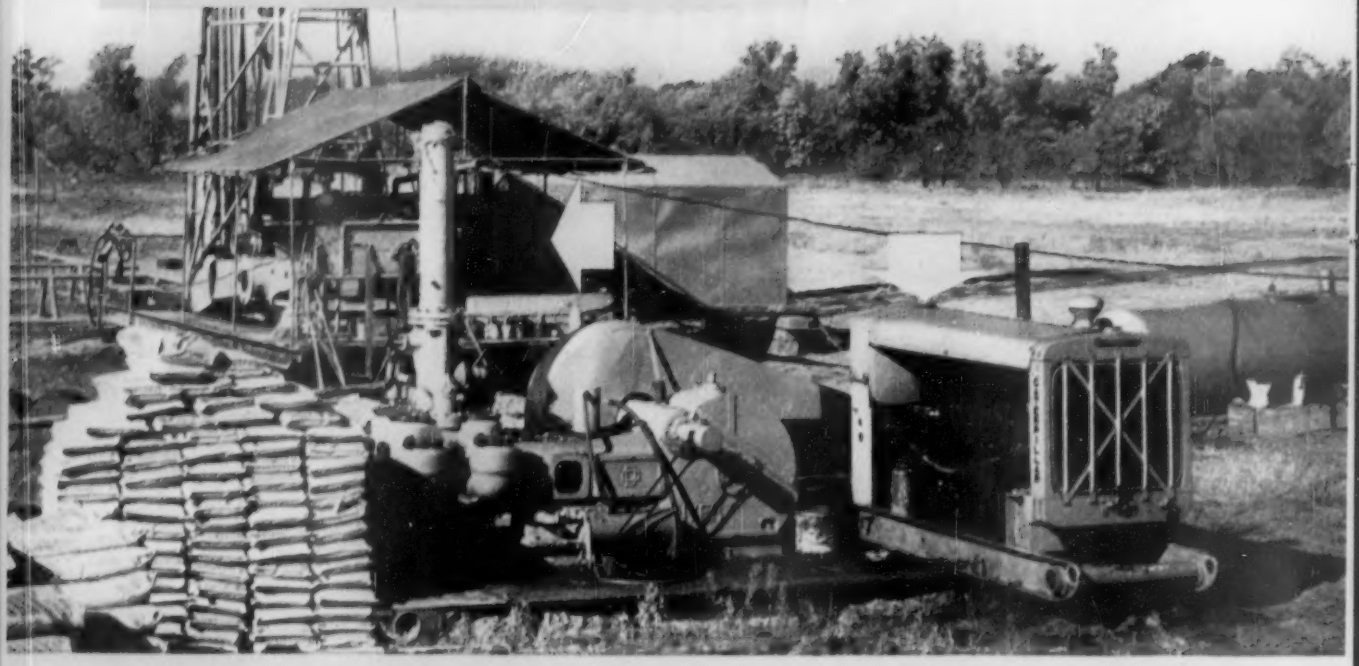

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Last year this pair of rugged diesels powered 50,000 feet of hole without down time due to engine failure.

"Because of the efficiency of these CAT* Oilfield Engines," reports owner Tom Jack, "we were able to pay out the rig in less than two years and acquired oil production worth $40,000. The best part about Cat power on a rig is its economy of operation. And the cost of fuel is practically negligible."

The engines power a Gardner-Denver mud pump and Cardwell draw works. Including moving time in and out, the unit drills a 2000-foot well in seven days.

The story of Tom Jack's two D13000s is the story of Caterpillar economy. Not only do Cat Oilfield Engines have a long life, but they stay on your job without a lot of repairs and lost time. Because they have few adjustments, the engines need little attention. Their efficient filters and seals keep harmful dust and abrasives out of working parts.

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MODERN HEAVY-DUTY OILFIELD POWER

by R. I. Martin

ELECTRIC LOGGING—57

How Laterologs 3 and 7 Differ in Arrangement

FIG. 2 shows how electrodes $A_1M_1'M_1A_0M_2M_2'A_2$ of Fig. 1 are connected to the surface equipment. When these seven electrodes are used, the device is known as Laterolog 7.

An alternating current of constant and measured intensity is passed through electrode A_0. Electrodes M_1M_2 and $M_1'M_2'$ are connected to the input of an automatic controller (1). By means of this device, an auxiliary current is passed through electrodes A_1 and A_2 so that the difference in potential between M_1M_2 and $M_1'M_2'$ is kept equal to zero.

Meter (2) measures the common potential of electrodes $M_1M_2M_1'M_2'$ with respect to electrode N. Electrode N is placed in the well at a large distance from the measuring device, but close enough to cancel most of the inductive coupling so that a good S.P. log may be obtained simultaneously.

The same control and measuring system may be applied to a somewhat similar electrode arrangement known as Laterolog 3. Laterolog 3 consists of a short central electrode A_0' with long symmetrical electrodes above and below A_1', A_2'. Electrodes A_1' and A_2' are connected together, and are used to control the shape of the current beam leaving electrode A_0'. In this way a disk of current with a thickness equal to the length of A_0' is passed through the formation.

Laboratory and field experiments have shown that both types of Laterolog have very similar responses when:

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

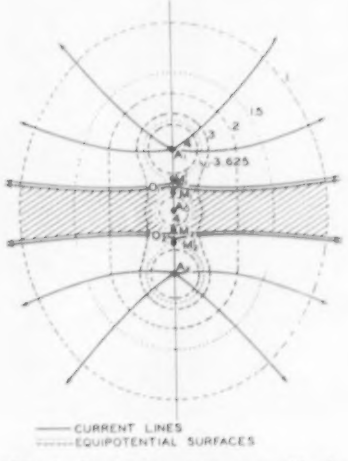

FIG. 1—Electrode arrangement with the Laterolog. This device has a high power of resolution and overcomes damping effects of the mud by using focusing electrodes.

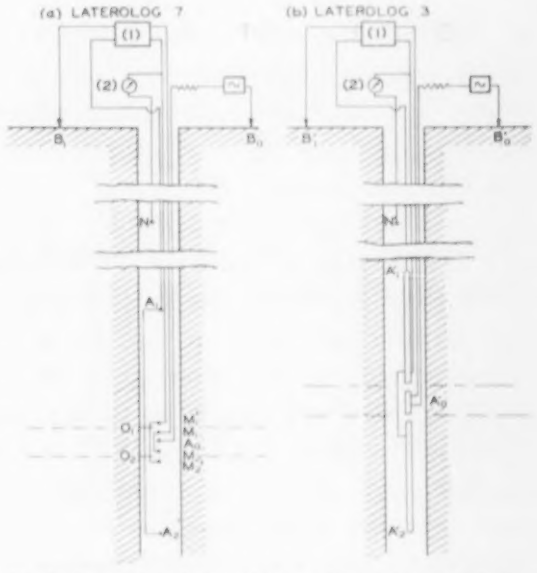

Fig. 2—Connection of electrodes to surface equipment in Laterologs. Both figures from Doll, "The Laterolog," Trans. A.I.M.E. Vol. 192, 1951.

1. The thickness of the current beams are the same.

2. The total length of the device for Laterolog 3 is appreciably greater than the distance between electrodes A_1A_2 in Laterolog 7.

Advantages claimed for Laterolog 7 are:

1. The response of the device may be computed. This is not possible in the case of Laterolog 3.

2. The absence of long electrodes will permit an S.P. log to be taken. This advantage will not apply, however, when the mud resistivity is so low that the S.P. curve is featureless. It will be seen later that an S.P. curve may be obtained using the Halliburton Guard Electrode. In this case the S.P. log shows minor differences from one taken with conventional electrodes.

3. It is possible to use the electrodes of Laterolog 7 to obtain simultaneously other resistivity curves.

The usual spacing for Laterolog 7 is $O_1O_2 = 32$ in., and $A_1A_2 = 80$ in. A shorter spacing, used when beds are thin in general, is $O_1O_2 = 12$ in. and $A_1A_2 = 72$ in. In the case of a homogeneous medium, calculations show that 90 per cent of the potential difference between the wall of the hole and infinity takes place within a distance which is about three times the length A_1A_2. In the case of thin beds, more resistive than the surrounding formation, this result is no longer true.

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EASY OPERATION. Because of friction free seating principle, frictional surfaces on all moving parts are reduced to a minimum which results in easy turning of valve stem. Orbit Valves can be operated easily when required even though not operated for long periods of time or infrequently.

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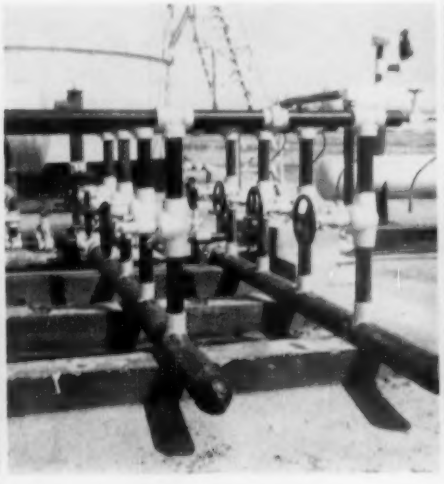
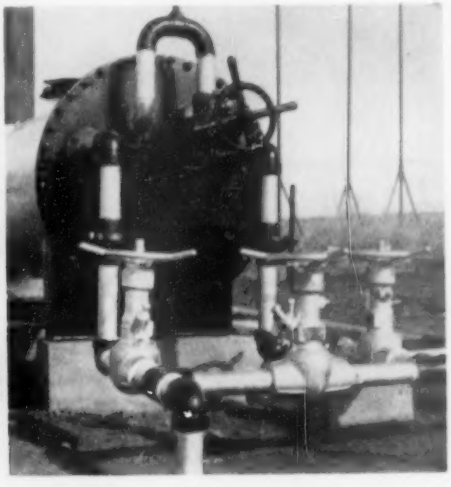


PRODUCTION HEADERS



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SEDIMENT FREE. There are no voids in an Orbit Valve body for foreign materials to lodge that may interfere with closure or operation of valve.

MATERIALS. Body and bonnet are made of drop steel forgings — the ultimate material for strength.

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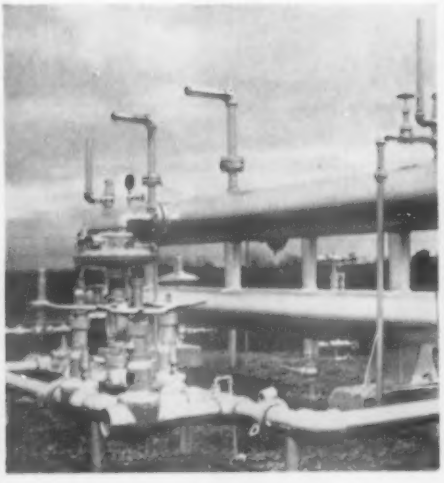

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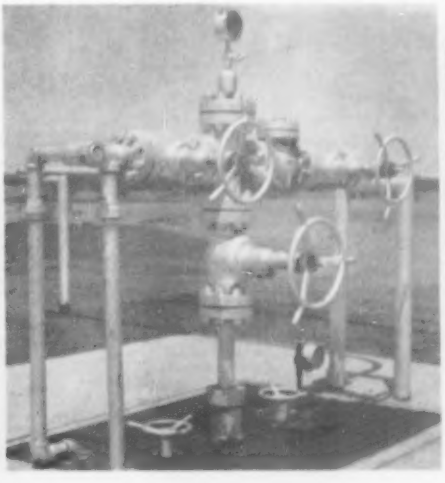

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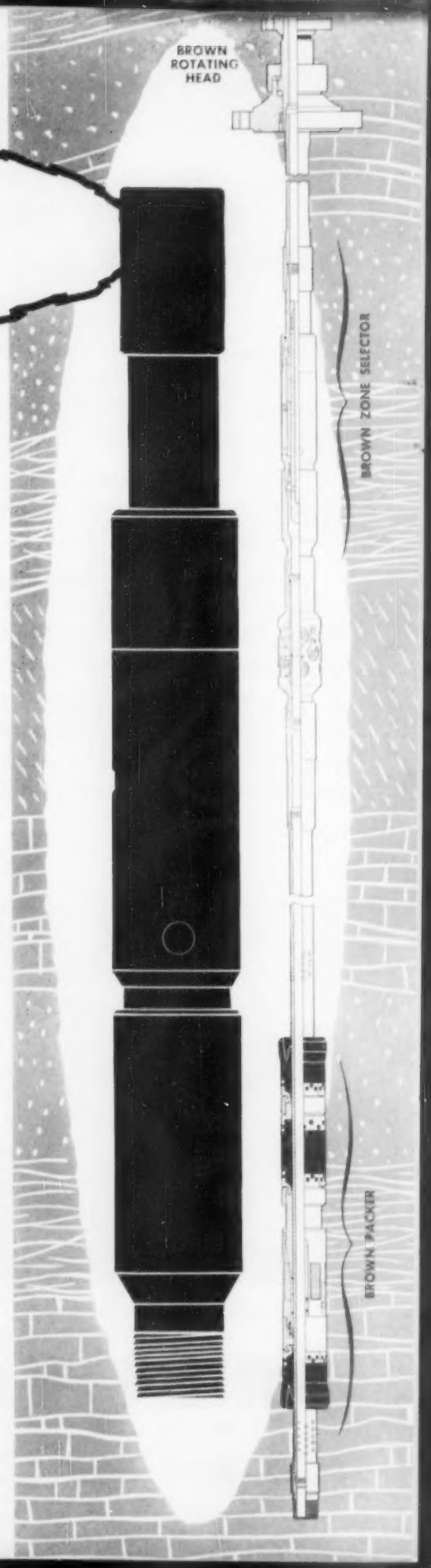
Its applications are: (1) In a dual zone well, independent bottom hole pressure and temperature surveys as well as flow potentials can be taken through the tubing. (2) Acidizing and formation fracturing—treating the upper zone without disturbing the lower. (3) "Unloading" the annulus through the tubing and circulating hot oil or other solvents to wash out paraffin. (4) Pumping two zones intermittently with a single pump. (5) In single completion wells when zone selector is run with packer mud can be left on top of packer and well brought in through tubing, also permitting circulation above packer to kill well.



BROWN OIL TOOLS, INC.

2214 CAMPBELL ST.

HOUSTON, TEXAS

by
Dr. R. F. Nielsen

Fluid Displacement—3

Calculating for a Five-Spot

COMPUTATION of the performance history of a pattern fluid-displacement process in general involves:

1. Estimation of average fluid saturations in the area swept at breakthrough of the displacing fluid (from viscosities and relative-permeability relations).
2. Sweep efficiency at breakthrough (from average mobilities in the swept and unswept areas).
3. Change in average saturation in the swept area with time (or production) after breakthrough.
4. Change in sweep efficiency with time after breakthrough.

Problem: Calculate the water-flood performance history of a five-spot initially 80 per cent saturated with oil of viscosity 5 cp. at reservoir conditions. The pressure is maintained above the bubble point of the oil. The oil-water viscosity ratio μ_o/μ_w is 5. Relative-permeability ratios are as follows, S denoting water saturation:

S :	0.8	0.75	0.7	0.6	0.5	0.4	0.35	0.3
k_o/k_w :	0	0.1	0.27	0.77	2.4	8.8	17.0	∞

Solution: The calculation will be made in terms of pore volumes. The fractional flow of water $F = (1 + k_o\mu_w/k_w\mu_o)^{-1}$ from the above table is plotted as a function of S in Fig. 1, and the tangent drawn from F = 0, S = 0.2. The bottom part is not shown. The average water saturation in the swept area at water breakthrough is 0.64, the intercept of the tangent on the top horizontal line (F = 1).

The fractional area swept is governed by the average mobility ratios for the swept as compared with the unswept area. The oil relative permeability is 0.95 ahead of the front, (20 per cent water saturation) from laboratory data. The tangent from S = 0.64 touches the curve at S = 0.52, so that 0.52 is the water saturation at the front of the swept area. Since mobilities near the front are those chiefly governing the "cusping in" of the water, we shall assume a water saturation of 0.6 for estimating sweep pattern.

The relative permeability to the water is 0.055 and that to the oil 0.042 at S = 0.6, from measurements in the laboratory. The mobility is therefore 0.95/5 = 0.19 in the unswept area and 0.055/1 + 0.042/5 = 0.063 in the swept area, so the mobility ratio is 3.0. From the experiments of Dyes, Caudle, and Erickson[1] (Fig. 4 of their paper) the areal sweep efficiency at breakthrough is 83 per cent for a mobility ratio of 3. Thus, neglecting the transition zone, the oil recovery at water breakthrough is 0.83 (0.64 — 0.2) = 0.365 pore volume.

The oil produced after breakthrough comes in part from a gradual increase in extent of the swept area and in part from a gradual lowering of the oil saturation in the swept area. D, C, and E give the areal efficiencies resulting from given total inputs in displaceable pore volumes (DPV).

DPV:	0.9	1.0	1.1	1.2	1.3
AE:	0.88	0.93	0.96	0.98	1.0

Assuming from the previous calculation that the water saturation after sweeping is 0.64, the additional oil is AE (0.64 — 0.2) — 0.365. The total injected water is DPV (S_{av} — 0.2). S_{av} will increase somewhat with time, but it will be taken as 0.7. The calculation gives:

Water input:	0.45	0.50	0.55	0.60	0.65
Oil prod. after breakthrough:	0.022	0.044	0.057	0.066	0.075

The additional production from the initially swept area is obtained from Fig. 1. If a tangent is drawn from a saturation S_a on the top line, touching the curve at S', F', the injected water (pore volumes of swept area) necessary to reduce the average saturation to S_a is $(1 - F')/(S_a - S')$. This is multiplied by 0.83 to convert to pore volumes of the entire five-spot. The oil produced after breakthrough is 0.83 (S_a — 0.2) — 0.365.

Fig. 1—Tangent method of estimating average saturation as a function of total fluid throughput.

S_a:	0.7	0.73	0.76	0.80
S':	0.585	0.623	0.68	0.80
F':	0.85	0.89	0.94	1.0
Water input:	0.635	0.807	1.11	∞
Add. oil:	0.050	0.075	0.100	0.135

In order that productions from this table may be added to those of the previous at equal values of injected pore volumes, the last two lines are plotted, including the value add. oil = 0 when water input = 0.365. Interpolation then gives

Water input:	0.50	0.55	0.60	0.65	0.70	0.90
Add. oil:	0.028	0.036	0.044	0.053	0.060	0.085

Adding the productions after breakthrough by the two mechanisms gives

Water in:	0.365	0.50	0.55	0.60	0.65	0.70	0.90
Oil after breakthrough:	0	0.072	0.093	0.110	0.128	0.135	0.160
Total oil:	0.365	0.437	0.458	0.475	0.493	0.500	0.538
Water prod.:	0	0.063	0.092	0.125	0.157	0.200	0.362

The production in barrels may be determined from the total pore volume of the five-spot and the formation volume factor of the oil. Gas-oil ratios are readily found from the slope of a plot of cumulative oil versus cumulative water.

References

1. Dyes, Caudle, and Erickson, Trans. A.I.M.E. (1954), Vol. 201, p. 240.
2. Craig, Geffen, and Morse, Jour. Petr. Tech. (A.I.M.E.), Jan. 1955.

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Among the

Drilling Contractors

Zephyr Gets New Rig for Julesburg Drilling Program

Zephyr Drilling Co., Tulsa, has purchased a new portable rig for use in an intensive slim-hole drilling program it is undertaking in the Denver-Julesburg basin of northeastern Colorado and southwestern Nebraska.

The assembly (shown in the adjoining picture) is built around a Bethlehem S-45-E draw works, capable of drilling to 7,500 ft. with 2⅞-in. pipe, and powered with a 260-hp. WAKBDSU diesel engine. It uses an L. C. Moore 94-ft. telescoping mast.

Draw works, engine, and mast are mounted on a three-axle, dual-wheel trailer. A Fruehauf trailer serves as combination doghouse and general house.

Main units can be moved by two trucks.

Lee Buys Out Partner in San Angelo Drilling Firm

W. Edward Lee has acquired the interests of his partner, Frank Caraway, in their Continental Drilling Co., Ltd., of San Angelo, Tex. The company has three rotary rigs, all operating on contracts in West Texas. It was organized in Tyler, Tex., in 1950, operating in the East Texas area, and moved to San Angelo in 1952.

One of its rigs is drilling for Fred W. Shield in the Westbrook field, 7 miles north of Westbrook in Mitchell County. Another is on a wildcat test American Trading & Production Corp. is putting down 17 miles east of Sonora, in Sutton County. The third is under contract to Green Mountain Oil Co. at a wildcat location in Hardeman County.

Maxwell Herring Drilling Co. is keeping a rig working for Rudco Oil & Gas Co. in the South Hallsville area, 15 miles northeast of Tatum, in Panola County, East Texas. Latest operation is 2-A Rudman - Genecov, a 7,000-ft. test ½ mile southeast of production in the W. M. Spencer Survey.

Drilling & Exploration, Inc., Houston, will drill another deep well for D. W. Skelton in southern Mississippi's active Soso field. The new operation, second for Skelton in this field, will be at 1 Williams, in 21-10n-13w, in the Jasper County portion of the three-county field. Skelton's first well is being completed as an oil producer in the field's Lower Cretaceous-Glen Rose pay around 12,000 ft.

Coastal Drilling Co., Los Angeles, is drilling another deep test, the second, for Richfield Oil Corp. on Santa Cruz Island, 25 miles off the southern California coast. The first test, recently abandoned as a dry hole below 8,300 ft., was located on the beach. The new operation is about 13 miles inland. Bud Fletcher is tool pusher on the rig.

Security Drilling Co. is under contract for a 6,300-ft. test to be drilled for H. J. Shearer, D. E. Hughes, and Panuco Oil Leases, Inc., of San Antonio, at a wildcat location in southeastern Atascosa County, Southwest Texas. Location, at 1 Elder, in the Daniel Brister Survey, is about 9 miles

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It is not easy to keep casing and tubing from leaking, especially in deep, high-pressure wells. The high percentage of metallic lead in 'Bestolife Lead Seal actually provides a plastic lead gasket for threads as joints are made up. That's why joints made up with 'Bestolife won't leak, strongly resist corrosion, and can easily be broken out—even years later. Your local supply store stocks 'Bestolife in 1¼, 5, 20 & 50 lb. cans. Unconditionally guaranteed.

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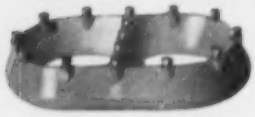

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east of Campbellton, near the Live Oak County line.

Don Johnston Drilling Co., Oklahoma City, is to drill Kingwood Oil Co.'s projected wildcat test 3 miles southeast of Pinneo, in Morgan County, northeastern Colorado. Its location, in 25-2n-55w, is for 1 Blake.

A **J. E. Hillyer** rig is on a 6,200-ft. Wilcox test Producers Corp. of Nevada is having put down in Trinidad Benites Survey 1, about 10 miles southwest of Tilden, in McMullen County, Southwest Texas. The test, listed as 1 Dilworth, is midway between two recent Edwards lime discoveries.

Bob Kleinknight, Bakersfield, Calif., has a three-well contract in the old, inactive Sargent field, near Gilroy, in Santa Clara County, northern Californit. Drilling is for Marion J. Vincent. Operations already are under way at the initial location, in 36-11s-3e. The field was discovered early in the century with drilling in the area dated as early as 1886.

Milam Drilling Co., San Antonio, has moved a rig to a wildcat location in eastern Dimmit County, Southwest Texas, where it will drill for Sun Oil Co. Location is for 1 Light, in the K&GN Survey 90. It is about 22 miles southeast of Carrizo Springs, and about 4 miles from the LaSalle County line. Hole is projected to 6,200 ft.

J & C Drilling Co., Refugio, Tex., has another deep test under way for Atlantic Refining Co. in the Chicolete Creek area, in Lavaca County, South Texas. It will be Atlantic's 3 Neuhaus, in the Thomas Bridges Survey. Drilling is set up for a depth of 10,000 ft.

Gilger Drilling Co., Houston, is scheduled for a 10,000-ft. wildcat test 5 miles south of Lake Charles, in Calcasieu Parish, southwestern Louisiana. It is a contract job for J. R. Frankel, of Houston. Location is for 1 Polson, in 34-10s-8w, 1½ miles north of South Lake Charles field.

Harry Bryant Dilling Co., Houston, has contracted for a 7,000-ft. test in the Lochridge area, 7 miles west of Rosharon, in Brazoria County, Texas Gulf Coast. The test, in the Andrew Robinson Survey 11, is for Michael T. Halbouty.

Gibson Drilling Co., Kilgore, Tex., has a new wildcat operation under way 2 miles south of Dialville, in Cherokee County, East Texas. It is a 5,500-ft. test at 1 Johnson, in the L. M. Vinning Survey. Drilling is for Ralph Spence and associates, of Tyler, Tex.

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Composite Catalog Page 3433

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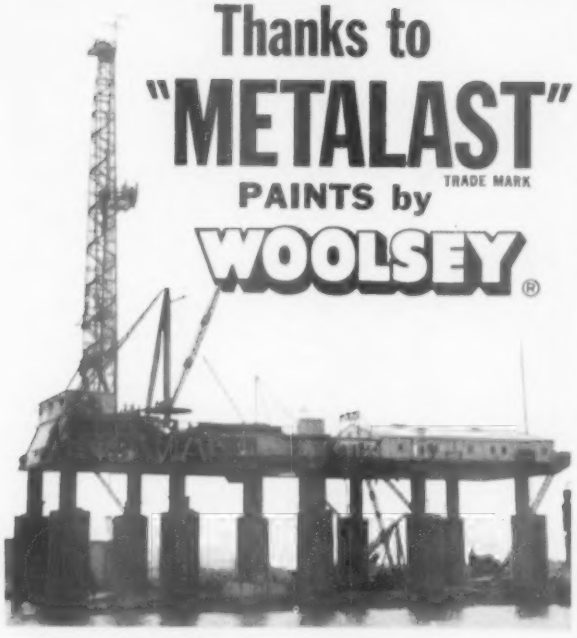

Ocean Drilling & Exploration Co. of New Orleans, La. chose "Metalast" to paint and protect this new $2,500,000 drilling rig.

• Offshore oil drilling installations are benefiting from the knowledge gained by the marine industry in recent years—that there is no better way to prevent the rusting and corrosion caused by salt air and water than by painting with Woolsey "Metalast."

"Metalast" is the marine vinyl coating developed by Woolsey during World War II—the most effective and economical type of corrosion-preventive known. Unlike ordinary anti-corrosive paints, "Metalast" does not deteriorate upon exposure—thanks to its special vinyl resin base. It is equally effective above or under water...and one painting lasts for years!

Woolsey "Metalast" is recommended for drilling rigs, pipelines, storage tanks. "Metalast" coatings also provide unsurpassed protection to steel structures in refineries, factories, water towers, etc., where chemical fumes and contaminates produce an extremely severe corrosive condition. Call or write, and we will be happy to mail technical information or arrange for the services of a Woolsey technical representative.

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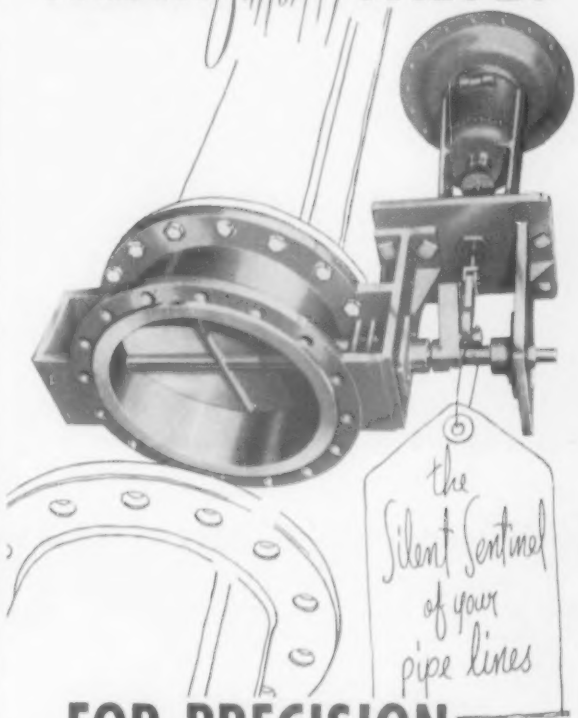

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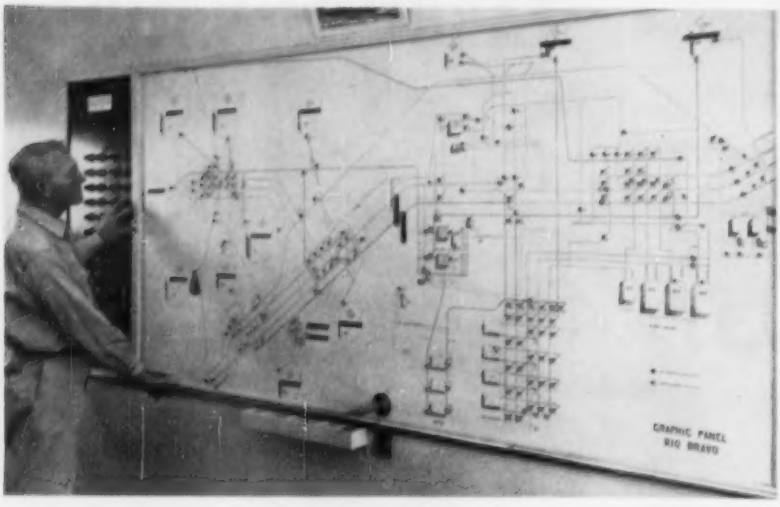


50-year-old station goes modern

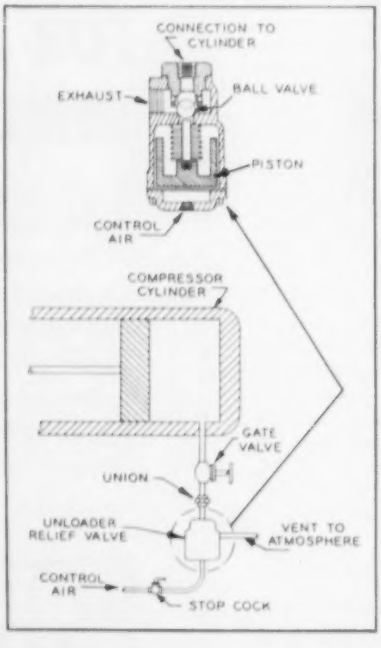
RIO BRAVO, a 50-year-old pipeline station of Standard Oil Co. (Calif.), has had quite a face lifting as far as controls go. The station is now pumping more crude oil than at any time in its history. Jobs for the pipeliners are much easier too, thanks to a modern control panel and a great many remote-controlled valves and remote-reading tank gages.

Rio Bravo is a gathering station as well as a main-line pump station. Several different crudes are pumped into the station from various fields in the San Joaquin Valley. These must be stored and then pumped northward in various mixtures, depending on need.

The old system of doing this was to walk out to the tank-farm manifold, open and close valves by hand as required, and then make rounds of the tanks to check gages and temperatures. The whole procedure was troublesome and time consuming.

Today, station operators can do a lot of their work by merely pushing buttons and twirling dials. Also, since the instruments and controls use the latest techniques, the operators get a more complete picture of what's going on at the station.

The big graphic panel of the pump station has all lines, tanks, valves, and pumps properly drawn in place. Red and green lights show valve positions. And a bank of push buttons are on each side for remote operation of the valves. On the opposite wall from the panel are meters and recording instruments for pressures, tank levels, and tank temperatures. Thus, the entire station operation can be set up and monitored from this point.



For easier removal of unloader relief valves

BY installing a gate valve between the compressor and the unloader, and a stopcock in the control air line as shown in the diagram, it is possible to remove the unloader relief valve for cleaning and repair without stopping the compressor. By closing the stopcock and the gate valve, the unloader is isolated from the system. The compressor will then continue to operate with the unloader removed.

The function of the unloader relief valve is to relieve or unload any pressure that might be in the compressor cylinder while the compressor is being started. With no control air pressure on the unloader, the spring pushes the piston down and the ball valve rests in its lower position.

After the compressor comes up to speed, the control air pressure is exerted on the unloader piston, overcoming the spring pressure and pushing the valve ball on its upper seat. This closes off the passage to the atmosphere and permits the cylinder to compress air at its normal discharge pressure. Suggestion by H. G. Hager of Phillips Petroleum Co.

New Cat D9 packs 230 hp. at drawbar

A BIG, new crawler for pipeline work has just been announced. It is the 56,000-lb. Cat D9 with an engine which delivers 230 hp. to the drawbar.

The new tractor will find extensive use in all types of heavy construction. But it will be particularly useful for heavy right-of-way clearing on cross-country pipeline projects.

The machine is driven by a six-cylinder diesel engine equipped with a turbocharger — something new for track-type tractors. The tractor will also have an oil-type clutch or, optionally, a torque converter. In-seat starting and hydraulic track adjustments are other features. Clutch, steering clutches, and brakes are all power assisted for ease of operation.

With the torque converter, the big machine has three speeds forward and two in reverse. Maximum speed is 7.8

Somebody is about to get the best service in the field

Here's a picture of a situation that happens every day. A telephone call from a user of O-C-T Equipment . . . and the O-C-T Service Organization gets in high gear.

As a result of its continuous expansion program during the past six years, Oil Center Tool Company now has the largest service organization in the field to help you set and service wellhead assemblies.

At present, you will find O-C-T service within a stone's throw of your operations throughout Texas, Louisiana, Oklahoma, Mississippi, New Mexico, the Rocky Mountain area, Canada and Venezuela.

There comes a time on every job when good service from your equipment supplier can save you money. And you'll be dollars ahead when you switch . . . and standardize . . . on dependable O-C-T equipment. It's available through more than 700 supply store points.

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S-1

PIPELINE PATROL

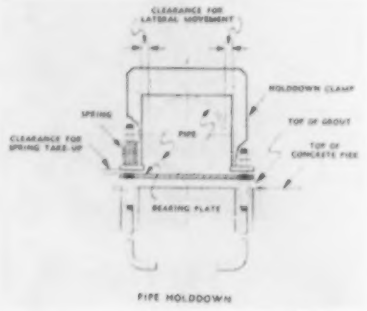
m.p.h. The direct drive offers six forward and six reverse speeds ranging from 1.6 to 6.8 m.p.h. With the direct drive, maximum drawbar pull is 60,860 lb. when adequate weight and traction is available.

The machine is made by Caterpillar Tractor Co. and has been under development for 10 years.

P. G. & E. sets up new pipe coating yard

THOUSANDS of feet of pipe are now being coated daily in a new coating yard of Pacific Gas & Electric Co. The Decoto plant in Alameda County, California, processes pipe which P. G. & E. uses in its gas system throughout northern and central California.

The plant is equipped to dry, shot-blast, and enamel-coat all sizes of pipe up to 12-in. It will eventually have a capacity of 40 to 50 thousand feet per day and will represent an investment of about $800,000.



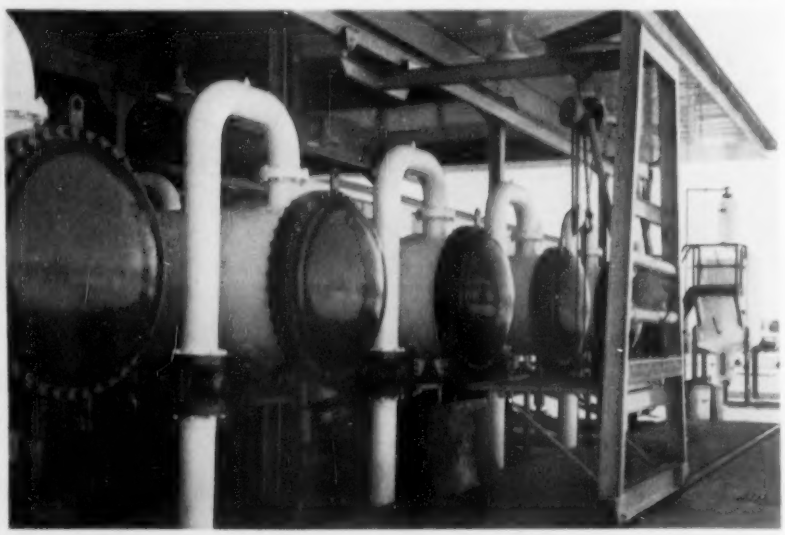
PIPE HOLDDOWN

Spring clamp holds manifold piping

A PROVEN device for holding manifold piping to piers is this spring-loaded clamp. Some of the main features are that it has spring tension to allow longitudinal movement of the pipe, and side clearance for lateral movement. The single spring also provides a certain amount of vibration damping. (Taken from a paper by H. S. Farnsworth presented at the California Natural Gasoline Association meeting, October 1954.)

How Platte captured a lost cooky

EVER lose a coupon after making a pipeline tap? It happened on Platte



THIS TRAVELING CRANE at Plantation Pipe Line Co.'s Baton Rouge station is a big help in strainer maintenance. Lugs welded on the strainer head are engaged by the hoist's hook. Bolts are then removed and the head taken off without danger of slipping.

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Let's take a new look at cathodic protection. Dow's new high potential anode, called GALVOMAG*, has 25% more current output than conventional anodes.

To put it another way—4 anodes now do the work of 5. It's easy to see why your installation costs in time and labor will go down in proportion.

In addition, economical protection in high resistivity soils can now be achieved. GALVOMAG's greater current output extends its use into ranges previously impractical for magnesium anodes.

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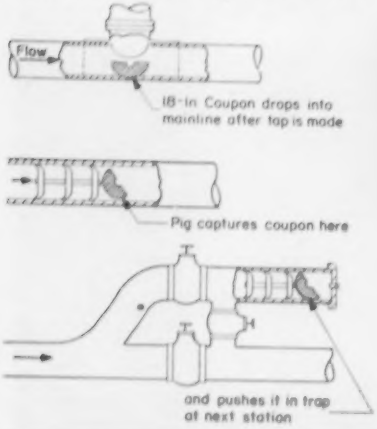
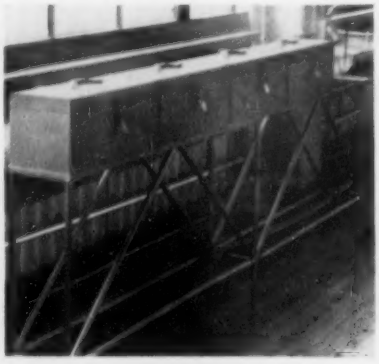
PIPELINE PATROL

Pipe Line Co.'s main line last year. The coupon, or cooky as it is often called, dropped into the main line as tie-in taps were being made for Platte's Moorefield, Neb., booster station.

A scraper was immediately launched at Casper, Wyo., some 350 miles upstream, with the idea of picking up the coupon. Line walkers in radio-equipped cars, checked its progress at road crossings. Microwave was used to relay mobile-radio instructions and reports back and forth between the line walkers and Platte's dispatcher in Kansas City. Finally, 12 days after launching, the pig picked up the coupon outside of the Moorefield station.

One day later, both pig and coupon entered a scraper trap at Holdrege, Neb., next station down the line. Taken from *The Platte Line*.





No moonlight raids!

TRUNKLINE GAS CO. uses individual tool boxes for operators in compressor stations as a means of cutting down on small-tool losses. The boxes are kept in the compressor building on a centrally located rack.

The peeled pup joint

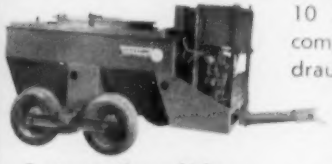
A BULL plug made by orange-peeling a pup joint makes a good receptacle for cigarette stubs. The big end is open and fits over a gallon bucket which collects the stubs at compressor stations of Gulf Interstate Gas Co.

At home on the highway or tough pipeline terrain!

CROSE-LITTLEFORD

MODEL 211-10 P2

PIPE LINE KETTLE



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A 118 Year Old Company Changes its Name

AMERICAN LOCOMOTIVE COMPANY is now
ALCO PRODUCTS, INCORPORATED

Why this change in a name so widely recognized and long established?

To our many employees and customers—those who know us best—the change is a logical one . . . one that many felt was a long time coming.

Our company has expanded its activities and diversified its products until our former name applied only to a part of our business. It no longer represented our new operations, which have grown beyond our important responsibility as a locomotive supplier.

Look at last year, for example . . .

In 1954, we introduced 18 new products for the chemical, petroleum, power, railroad, and atomic energy markets.

That alone underscores the obvious fact that we are no longer a specialty company but have become one of America's broadly based industrial manufacturers.

So today, this new name has been adopted to reflect the vigorous new company that stands behind it. To our many friends, of course, we have been known for years as "Alco"—now it is official.

And we shall continue to produce traditional "Alco" quality in our new as well as our long-established product lines.

ALCO

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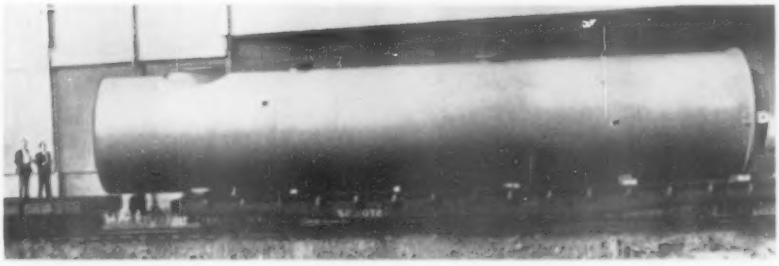
Use the handy Time-Saver Cards ✓✓✓ to obtain additional information on these items

by Dan B. Miller



Silencer Made for High, Low Frequency

A new line of acoustic silencers is designed to eliminate high and low-frequency noises caused from gas, steam, and air-operated equipment. Acoustic reactance chambers using special sound-absorbing material are used.

A complete range of models will be offered in standard 8 to 30-in. pipe sizes. Special sizes may be engineered to the specific application. For example, a silencer designed for what is believed to be the world's largest snubber, handles the exhaust of a 5,000-kw., simple-cycle, gas-turbine generating unit. This unit measures 74 ft. long by 12 ft. in diameter. *Burgess-Manning Co.*

Check No. 1 On The Time-Saver Card

●

Emulsion Treaters Already Proved in Mid-Continent

More than 100 installations of Erwin horizontal emulsion treaters in New Mexico, Texas, and Louisiana have proved the unit's versatility in handling a variety of treating problems economically and efficiently with a minimum loss of gravity in stock tanks.

The scale-resistant, tritube firebox provides increased heating capacity and virtually eliminates firebox burnouts due to scale deposition and corrosion. Double inside jackets around the heating chamber function as emulsion preheaters, clean-oil coolers, and heating-chamber insulators.

An automatic free-water knockout eliminates costly heating of free water and is designed to salvage heat from treated-out water. These features provide maximum heating to emulsions with minimum heat loss to atmosphere and outgoing fluids. Consequently, less gas is consumed per barrel of treated oil.

Large settling area and volume is provided to allow ample time for separation of water from oil. Treated oil and water is filtered through independent strata of a fiber-glass element before leaving the treater. Vapors released from heated oil are commingled with treated oil and are reabsorbed by cooling in the heat exchanger. Sand grates exclude sand and sediment from the treater.

These Erwin treaters are skid-mounted and are offered in five sizes to meet any treating problem. *Salt Water Control, Inc.*

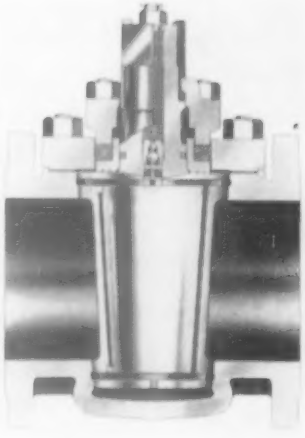
Check No. 2 On The Time-Saver Card

●

Multiple Sealing Featured In Newly Designed Valve

Longer life, ease of operation, ease of adjustment, and positive pressure-sealing are claimed for a new lubricated plug-valve design. A feature of the valve is multiple sealing which includes lubricant, O-ring, gland liner, and packing seals.

Four vertical lubrication grooves in the plug assure uniform and adequate distribution of a sealing lubricant around the port areas. Two grooves, 180° apart, do not cross body ports in operation. Two grooves, 180° apart, do cross body ports in operation but



are connected with lubricant supply only when the plug is in fully opened or closed position.

The hydrocarbon-resistant O-ring provides a positive seal between the gland liner and the plug shank while the resilient packing effectively seals between the gland liner and the cover. The bottom of the gland liner mating

faster

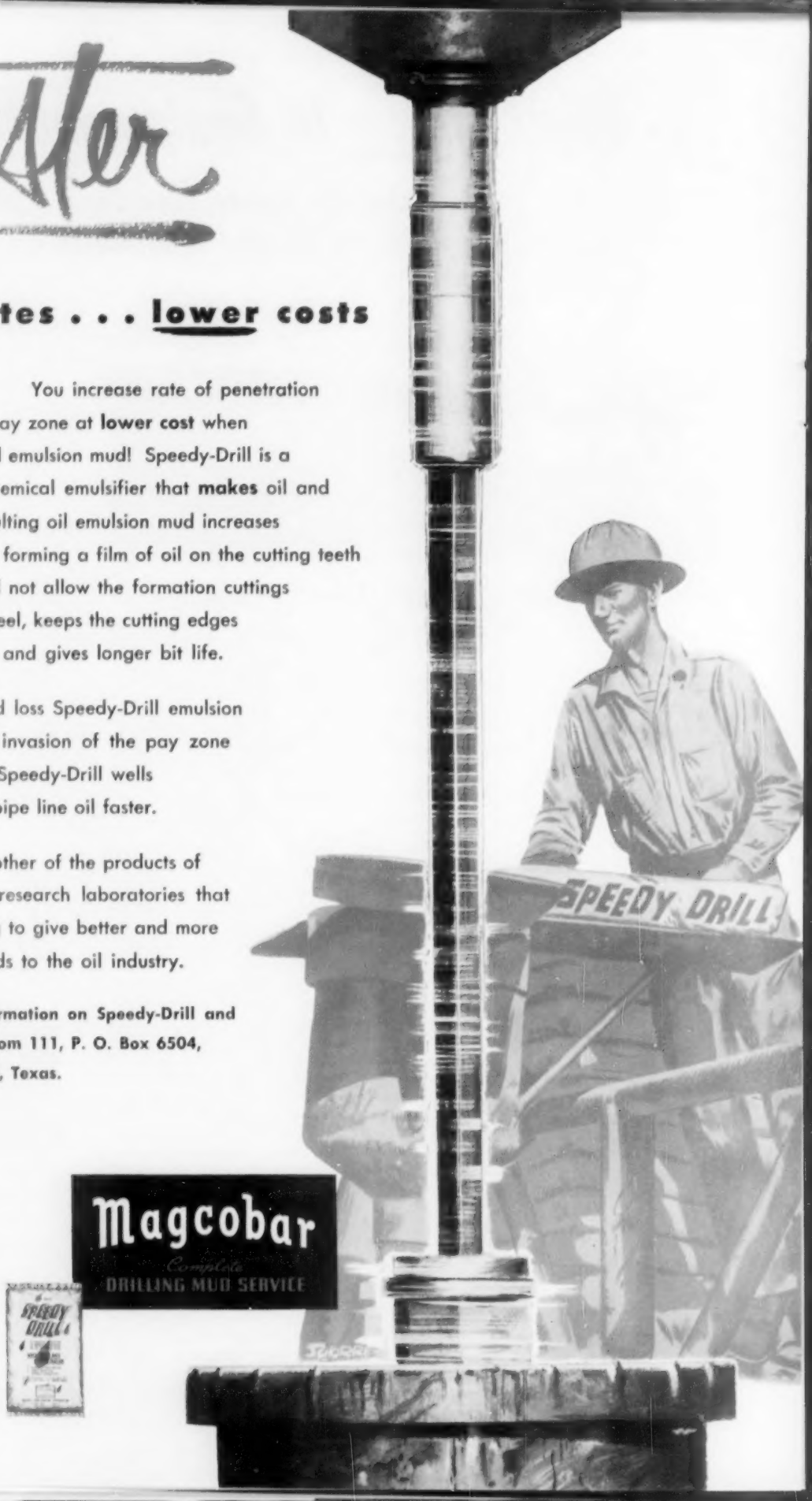
drilling rates . . . lower costs

You increase rate of penetration and protect your pay zone at **lower cost** when Speedy-Drill is in the oil emulsion mud! Speedy-Drill is a formulated chemical emulsifier that **makes** oil and water mix. The resulting oil emulsion mud increases drilling rates by forming a film of oil on the cutting teeth of the bit. This film will not allow the formation cuttings to adhere to the steel, keeps the cutting edges much cleaner and gives longer bit life.

Low fluid loss Speedy-Drill emulsion muds reduce filtrate invasion of the pay zone to a minimum. Speedy-Drill wells clean up and produce pipe line oil faster.

Speedy-Drill is another of the products of Magcobar's advanced research laboratories that are constantly working to give better and more economical drilling muds to the oil industry.

For detailed information on Speedy-Drill and its advantages, write Room 111, P. O. Box 6504, Houston 5, Texas.



Magcobar
Complete
DRILLING MUD SERVICE

with the lapped surface on the top of the plug provides an additional seal.

Precision gland adjustment is achieved by the use of fine thread studs and semifinished, washer-faced nuts on spot-faced bearing surfaces on the gland. A minimum of recurring adjustments is required because the resilient packing is completely isolated from all moving parts. A position indicator on top of the plug shank and a visual stop integral with the gland show the position of the plug at a glance. *Ohio Injector Co.*

Check No. 3 On The Time-Saver Card

●

What's New . . . Use the handy Time-Saver Cards

Draw Works Have All Air-Friction Clutches

Both the Model J-450 twin-engine draw works pictured above and its companion model, the S-350 single-engine draw works, are available with engines up to 520 hp.

These new draw works have proved to be extremely fast in operation and are equipped throughout with the new Model-39 air-friction clutches. All clutches are mounted on the outside of the frame and are readily accessible.

The basic construction of the hoists have been Fabriformed, resulting in a lighter-weight draw works than any previous model in the same capacity. The oil-bath chain drives are fully enclosed and pressure lubricated.

The design of Model J-450 and Model S-350 includes a high-pressure air system reduced for clutch operation. This results in a drier system with less moisture trouble. A 22-in. single Hydrotarder is built into the main frame.

The Model J-450 is available with sand-line drum, mud-pump drive, and a reverse for the entire rig. The Model S-350 is available with sand-line drum and a reverse for the entire rig. Fawick air clutches are offered as optional equipment. *Cardwell Manufacturing Co.*

Check No. 4 On The Time-Saver Card

●

P & H Diesels Made With Simplified Fuel Systems

An entirely new fuel system designed around the Roosa-Master pump is now standard equipment on all Harnischfeger diesel engines.

The new fuel system does away with a total of 131 separate parts, and is 49.5 lb. lighter in weight. It is far easier to understand, and requires less maintenance than the former system. Another feature is easier starting with injection automatically retarded until engine speed reaches 500 r.p.m. Injection is then gradually advanced as the operating speed increases. This results in extremely fine idling characteristics as well as smoother over-all operation.

Described as a single-cylinder, opposed-plunger, inlet-metering, distributor-type pump, it is a sealed and fully self-contained unit. It incorporates (1) a built-in, vane-type fuel-transfer pump; (2) a governor; (3) an injection rotor with plungers; and (4) a metering valve and distributor head. The pump is self-lubricating and has no ball bearings, no operating valves, and no gears.

The Roosa-Master pump, without using any external cams or valves, eliminates the separate pumps for each cylinder. It also does away with the individual adjustments ordinarily required to time and balance the load of each cylinder.

Premium lightweight fuels are not required since these diesel engines with the new pump and injection system operate on any type fuel that will flow. *Harnischfeger Corp.*

Check No. 5 On The Time-Saver Card

●

Collapsible Container Cuts Handling Costs

The Paltier canvas container permits handling of bulk solids with marked savings in handling costs. It is supplied with aluminum or steel base and tiering posts.

The canvas container collapses flat with the base when not in use or for return shipment. When tiering posts are set up, the container becomes a bulk container which can be used for bulk solids, granules, powders, and many other items.

The container can be furnished in canvas, duck, rubber, or plastic material. It is available either with zipper, straps, or other type closures or with an open top with hook-on-type container. Standard sizes are 32 by 40 by 24 in. and 40 by 48 by 24 in. *Paltier Corp.*

Check No. 6 On The Time-Saver Card

●

Model-B Dew-Point Tester Features Large Windows

Model-B dew-point tester for field or laboratory use features several improvements. Its window area is four times as large as that on older models. O-rings are now used to seal the joints. By using O-ring seals and finger-tightening nuts, the window and mirror can

JELFLAKE

DOWELL's fragmented plastic foil restored circulation after substitute materials had failed to seal thief zone

In an area with a thief zone near 9800 feet, one operator normally used a gel-chemical mud containing Jelflake® while drilling through the zone. On a recently drilled well, however, he decided to cut costs by using cane fibers and cotton seed hulls. When the thief zone was reached, the operator spent 13 days, at a cost of $1100 a day, trying to regain lost circulation without success. His total loss was over $26,000 including rigtime.

Then Jelflake was added to the mud system and circulation was promptly restored for only $3500. Circulation was maintained to total depth at a cost of only $150 a day—by adding two pounds of Jelflake per barrel of mud.

Jelflake is inert to all well fluids and is not affected by bacterial action or high temperature. Jelflake will not clog circulating equipment, perforations or bit water courses. Just add it to the mud through a hopper or sprinkle it near the mud hog suction for fast, effective mud-loss control.

Keep a supply of Jelflake on hand. You can buy it in 25-pound, wetproof bags from your mud distributor or local Dowell station. For further information write to Dowell Incorporated, Tulsa 1, Oklahoma, Dept. E-11.

services for the oil industry

DOWELL

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be quickly cleaned and the unit can be easily disassembled.

The tester's working pressure is 1,000 psi. for natural gas and 200 psi. for propane vapors. Tests show that dew points can be duplicated to within 0.2 F.

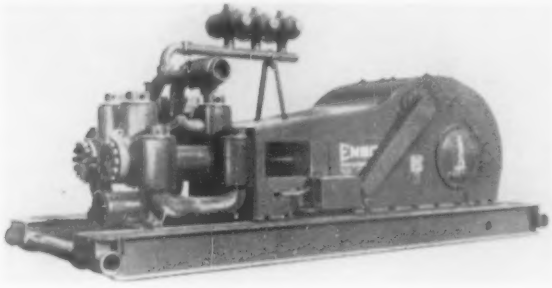
To provide turbulence, gas to be tested enters the side of the chamber and leaves at the bottom. The refrigerant valve is a squeeze-type toggle valve that operates easily by squeezing. The portable instrument, complete with carrying case, weighs 13 lb.

Check No. 7 On The Time-Saver Card

●

What's New... Use the handy Time-Saver Cards

In operation, gas or vapor passes over a polished metal surface cooled by a refrigerant. The gas is cooled to the temperature of the surface. When the dew-point temperature of the gas is reached, dew forms on the metal surface. A thermometer inserted in the metal shows the temperature of the surface. *Refinery Supply Co.*



D-1000 Pump Meets All Circulation Needs

The new D-1000 slush pump has been developed to meet all the specialized mud-circulation requirements of jet-bit, big-hole, and deep drilling. A new power-end lubrication system uses two positive-displacement plunger pumps operating in parallel to assure proper lubrication to all bearings and working parts. Roller bearings are used throughout the power end.

New-type tapered threads are incorporated in crosshead extension and piston-rod connections for tighter joints and quick removal. Threaded stuffing-box glands assure easier and more proper adjustment. Threaded valve-cover design enables quick valve inspections.

The pump also incorporates Fabriform construction, steel power frame, and exposed-liner design. Crossheads are equipped with replaceable Meehanite slippers which slide on Meehanite guides. A piston-rod lubricator, a pulsation dampener, and a shear relief valve are also included as standard equipment.

The pump is rated at 1,000-b.hp. input at 60 s.p.m. The length of the stroke is 18 in. With its maximum bore (8¼ in.), it will deliver 933 g.p.m. at a pressure of 1,562 psi. With its minimum bore (5¾ in.), it will deliver 419 g.p.m. at a pressure of 3,480 psi. Weight is 50,500 lb. *Emsco Manufacturing Co.*

Check No. 8 On The Time-Saver Card

●

Skullgard Is Reinforced At Most Critical Areas

Workers on jobs that involve head-injury hazards are offered added protection in this new Skullgard plastic safety helmet.

The helmet was designed to offer extra protection in "the danger zone"—the front, top, and back areas of a hat that working positions expose most often to impact. The Skullgard incorporates a special reinforcement in this zone's three vital areas.

The helmet is high-pressure-molded in one piece from hard, smooth, laminated plastic. The design, rounded contours, and strength of the helmet provide effective deflection of falling or flying objects and offer protection against bump-hazards for men working in close quarters. *Mine Safety Appliances Co.*

Check No. 9 On The Time-Saver Card

●

Flowmeter Calibration Is Based on Load Cell

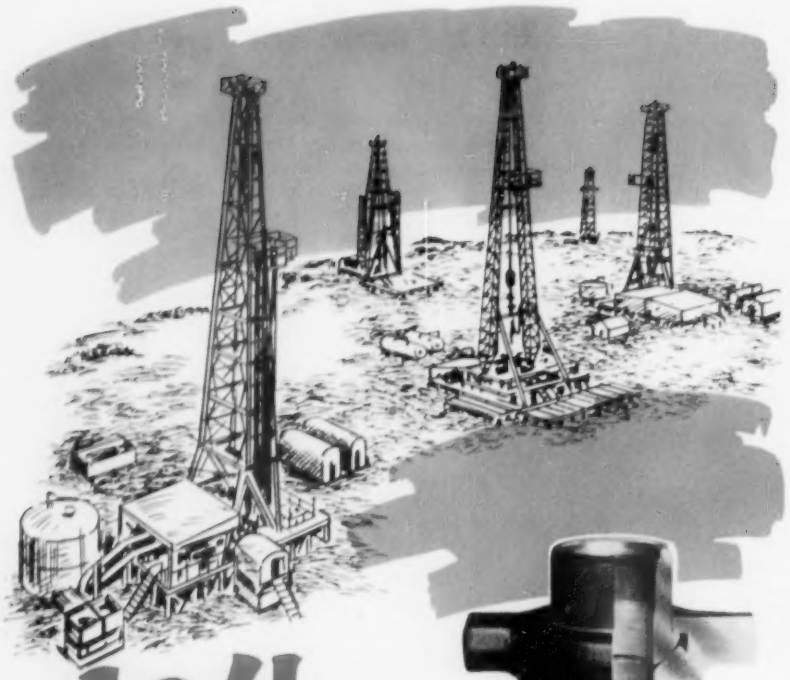
A new flowmeter-calibration system is based on time and weight measurements with a standard Baldwin SR-4 Load Cell.

The instrument is an indicator-controller in which electrical indications of weight from the load cell start and stop a timer automatically at two preset weights of liquid. This occurs after the liquid flows through the flowmeter to be calibrated into tank supported by the load cell.

The illustrated instrument was designed for use with a precision-type load cell of 1,000-lb. capacity. The weight dial (below) can be read within one point and the timer dial (above) gives the time of flow to one-thousandth of a second.

Empty tank weight is zeroed out on the weight dial. Any of five incremental weights of 50 to 700 lb. are set by means of a knob on the instrument panel in preparation for calibration of a flowmeter. At the instant a specified weight of a liquid (such as 30 lb. of oil) has flowed through the flowmeter into the tank, the timer is started automatically. When the preset incremental weight has flowed into the tank, the timer is stopped automatically. A wide range of flow rates can thus be checked by simultaneous precision measurements of the incremental weights and times of flow. *Baldwin-Lima-Hamilton Corp.*

Check No. 10 On The Time-Saver Card



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They're NEW

- Bulletins
- Catalogs
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From Naphtha to Grain Dust, Booklet B-2402, describes a new corrosion-proof a.c. motor. This booklet gives complete information on the versatility and design characteristics of this industrial motor, with examples of its many applications to all industries having corrosive conditions inherent in processing or production. In addition, it includes details on the various components of this motor, proving why it is completely corrosionproof. *Reliance Electric & Engineering Co.*

Check No. 11 On The Time-Saver Card

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Titanium Tubing and Pipe. Two grades of titanium tubing and pipe are described in a new-product bulletin. The bulletin lists the advantages and applications in detail. It also gives the physical properties of both grades, together with data on corrosion resistance, machining characteristics, forming, welding, heat treating, and cleaning. A selection of test pictures shows conditions the titanium can be expected to withstand in application. *Carpenter Steel Co.*

Check No. 12 On The Time-Saver Card

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Motor Buying Information Catalog. A new 28-page catalog of buying information on a.c. motors is designated GEC-1026. The bulletin presents complete buying information on standard a.c. fractional and integral horsepower motors in most general use. Included are general and definite-purpose fractional-horsepower motors and gear motors. A special section on the selection of integral horsepower motors covers horsepower requirements, enclosures, starting-current limitations, speeds, motor types, and selection of fuses and circuit breakers. *General Electric Co.*

Check No. 13 On The Time-Saver Card

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Jerguson Sight Flow Indicators. Data Unit No. 253 describes, illustrates, and gives specifications on Jerguson's line of transparent and reflex sight-flow indicators for use on any pipeline ½ to 2 in., N.P.T. The special design which

gives improved visibility of liquid flow is described. *Ierguson Gage & Valve Co.*

Check No. 14 On The Time-Saver Card

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Caterpillar Drill-Rig Power. This two-color, eight-page brochure, Form D513, describes the various uses of Cat diesels in drilling-rig power plants. A list of the 12 Cat oil-field engines and electric sets available is included in the booklet. *Caterpillar Tractor Co.*

Check No. 15 On The Time-Saver Card

•

Oil-Field Friction Materials. This 16-page catalog features a comprehensive specification chart of oil-field friction blocks as well as roll and cut-length linings for draw works, pulling machines, and winches. It gives the block size, number per set, size and number of bolts required per set, and the list price. Specifications are in alphabetically arranged columns for easy reference. The manual points out all blocks that are furnished drilled for ⅜-in. bolts are equipped with a split-type expanding sleeve to keep blocks absolutely tight on the band. *Thermoid Co.*

Check No. 16 On The Time-Saver Card

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Lubricated Plug Valves, a six-page fold-out, includes specifications, service recommendations, and functions of a newly designed line of lubricated plug valves. Annotated illustrations point out advantages and special features. *The Ohio Injector Co.*

Check No. 17 On The Time-Saver Card

•

Cooling-Tower Wood Can Be Protected is subject of technical paper No. 130. In recent years, deterioration of cooling-tower wood has been recognized as a problem of increasing importance in industry. This paper discusses how chemical and bacteriological attack can be controlled by acid treatment and wood preservatives to kill fungi. *W. H. & L. D. Betz.*

Check No. 18 On The Time-Saver Card

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Pipeline Construction Equipment, a new general catalog, carries list prices and daily and monthly rental rates on wrapping machines, dope machines, cleaning and priming units, dope pots, beveling and welding equipment, detectors, blocks and lines, pipe straighteners, and bending shoes. All equipment is illustrated and fully described. *Remco Manufacturing Co., Inc.*

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UP-TO-DATE PIPE LINE MAPS

"JACOBSON'S MAP SHOWING CRUDE OIL AND GASOLINE PIPE LINES OF THE UNITED STATES AND CANADA"

SHOWS: Crude oil pipe lines in blue—gasoline pipe lines in red—key refineries with capacity barrels crude oil per day—principal cities and towns.

Pipe lines are indicated with dashes, dots and straight lines so that it is possible to trace individual pipe line systems. Pipe sizes are shown on pipe lines in Rocky Mountain area.

Size 54" x 76". Scale 1"=40 miles.

"JACOBSON'S MAP SHOWING NATURAL GAS PIPE LINES OF THE UNITED STATES AND CANADA"

SHOWS: Natural gas pipe lines are indicated with dashes, dots and straight lines so that it is possible to trace individual pipe line systems—major gas fields are shown in solid red and general gas areas are outlined in red—principal cities and towns.

Size 54" x 76". Scale 1"=40 miles.

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EQUIPMENT MEN . . . in the News

Raidl Named Manager, West Coast Sales by BS&B

The appointment of John H. Raidl as sales manager, West Coast district, with headquarters at Los Angeles, has been announced by Black, Sivalls & Bryson, Inc. Raidl will supervise sales of BS&B products through sales centers at Los Angeles, San Francisco, Bakersfield, Portland, Seattle, Spokane, and Salt Lake City.

Starting with BS&B as a draftsman in 1946, Raidl soon became junior engineer, then safety-head salesman in 1950. In November 1952 he became assistant sales manager for safety heads —the post he held before his new appointment.

Industrial Advertising Firm Incorporates

Brennan Advertising Agency, Houston, has incorporated its organization, according to an announcement by J. Earl Brennan.

This action was taken in order to expand the ownership of the agency operation and to increase services to a growing list of accounts in the Southwest.

John E. McGary, accountant executive with the agency for the past 4½ years, has been elected executive vice president. Edwin Tron, accountant executive for 3 years, is vice president; and V. S. Brennan, agency auditor, has been named secretary-treasurer. Present officers will serve as directors of the corporation. Later, additional directors will be appointed from within the agency.

Brennan Advertising Agency has been a member of the American Association of Advertising Agencies for a number of years. Besides A.A.A.A. membership, the agency has received recognitions and memberships in A.B.P., S.N.P.A., S.A.A.A., N.I.A.A., A.P.A., A.F.A., and S.A.I.E.

Durkee Elected to Dresser Board of Directors

R. S. DURKEE

The election of Rodney S. Durkee to the board of directors and appointment to the executive committee of Dresser Industries, Inc., has been announced by H. N. Mallon, president of Dresser Industries, Inc., Dallas. Durkee is chairman of the board of the Lane-Wells Co., recently acquired by Dresser. He joined Lane-Wells as executive vice president in 1938 and has been the company's president since 1939.

For more than 20 years, Durkee was a leading executive with several of America's largest oil companies. He is a former director of the American Petroleum Institute and a past president of the Controller's Institute of America.

Cummins Promotes Four Executives

R. E. Huthsteiner, president of Cummins Engine Co., Inc., Columbus, Ind., congratulates four members of the company on recent promotions. Huthsteiner is shown shaking hands with E. D. Tull, now executive vice president of the diesel manufacturing firm. Watching are: R. B. Stoner, newly elected vice president, personnel; C. R. Boll, newly elected vice president, sales; and P. J. Every, named general sales manager

Dr. Koepf Joins Core Lab's Administrative Staff

E. H. KOEPF

Dr. Ernest H. Koepf has joined the administrative staff of Core Laboratories, Inc., as manager of the company's research and development department.

According to John D. Wisenbaker, president of the firm, Koepf will plan and direct an expanded research program including: (1) the development of concepts of factors affecting reservoir performance; (2) the advancement of new analytical procedures; and (3) the improvement of existing methods now used in determining the presence of hydrocarbon-bearing formations and their individual productive characteristics.

Immediately prior to his association with Core Lab, Dr. Koepf served as administrative coordinator in the crude production department of The Atlantic Refining Co. From 1952 to 1954 he was associated with Texas City Chemicals, Inc., as vice president and general manager, and was in active charge of all phases of plant organization, construction, and operation.

Marine & Petroleum Supply Elects Five Directors

P. A. Mattingly, president of Marine & Petroleum Supply Co., has announced that the stockholders elected five new directors: R. A. Shira, George D. Jonte, John L. Christian, Jack E. Burkett, and James B. Oliver.

Mattingly also announced that the following promotions and new officers were made. R. A. Shira, who has been with the company since it was organized in 1946 and has been serving in the capacity of sales manager for the past 10 months, was elected vice president in charge of sales. S. M. Vaughan, whose service record began with the company in 1954 as its secretary-treasurer, was elected vice president and assistant general manager.

Jack E. Burkett, who has been serving as office manager for several years, was elected treasurer of the corporation. James B. Oliver, who has been chief accountant for the past year, was elected the corporation's secretary.

George D. Jonte, who has been with

the company for a number of years and is at present the inside sales supervisor, was elected assistant secretary of the corporation.

The company was organized by Ed T. Malloy and associates as a wholesale supply house to serve the heavy industry of the area.

Union Pipe Is Sales Agent For Japanese Tubular Firm

C. H. SHIRO

Charles H. Shiro, executive vice president of Union Pipe, Inc., with offices in New York City, has announced the appointment of Union Pipe, Inc., as exclusive sales agents of Sumitomo Metal Industries, Ltd., of Osaka, Japan, for the sale of A.P.I. monogrammed seamless and welded oil-country tubular products.

Union Pipe will carry stocks of A.P.I. casing, tubing, and line pipe at Houston, New Orleans, and Los Angeles.

Union Pipe has established a southwestern division office at Houston in the City National Bank Building under the direction of Robert L. Horlander, general manager, and G. H. (Pete) Larson, district sales manager. West Coast facilities and personnel will be announced at a later date.

Fullinwider Made Domestic Sales Manager by Mission

FULLINWIDER

T. R. Fullinwider has been named domestic oil-field sales manager of Mission Manufacturing Co., W. T. Campbell, executive vice president, has announced.

Fullinwider was promoted from the position of assistant to the domestic sales manager. He has been with Mission for 7 years, and had extensive experience in the supply and service fields before joining Mission.

Welex Jet Names Wells To Tulsa Division Sales

James E. Wells has been appointed division sales engineer for the Tulsa division offices of Welex Jet Services, Inc. Wells, who has been with Welex for over 3 years, has been working with radioactivity well logging for the past year.

Blue Demon Bits Shipped to Persian Gulf

Six-and-a-half tons of Blue Demon bits, manufactured by Herb J. Hawthorne, Inc., of Houston, are being loaded aboard the Dutch freighter Wonogiri for shipment to the Persian Gulf. The bits, 2,000 of them, are destined for use in seismic operations in the Middle East. An order for the bits was received in the Hawthorne office on March 4, and the Wonogiri sailed from the Port of Houston on March 15 with the shipment of bits in its hold.

Lunkenheimer Holds Meetings at Continental Stores

The group above shown sitting in front of shelves full of Lunkenheimer valves is in the Oklahoma City store of The Continental Supply Co. They attended one of a series of sales meetings conducted at various Continental stores by Lunkenheimer Co. In the front row are: E. R. Tieberman, Dallas, Lunkenheimer representative who conducted the meeting; C. A. Robinson; district manager O. C. Tubbs; and store manager C. K. Treast. In the second row are: W. H. Long, W. E. Lasseter, Doc Creel, Al Farmer, John Williams, and George Culpepper. In the third row are: Dewey Loudermilk, F. O. Furr, L. L. Ballew, Sam Cary, L. N. Sever, and E. C. Begley. All but Tieberman are with Continental.

Unit Rig Makes Gregor Merchandise Manager

J. P. GREGOR

J. P. (Jack) Gregor has been appointed general merchandise manager for Unit Rig & Equipment Co., Tulsa, according to Ken W. Davis, Jr., president. Gregor will be in charge of all distributor relations including units and parts-stock control and distribution.

Gregor joined Unit Rig in 1953 as field sales engineer at Oklahoma City. He later was transferred to Tulsa as assistant to the vice president of sales. Prior to joining Unit Rig, he was associated with Phillips Petroleum Co. as design engineer; Broderick & Bascom Co. as sales engineer in the Gulf Coast area; and Caterpillar Tractor Co. as special-oil-field sales representative.

Oilwell's Canadian Area Makes Sales Staff Changes

The promotion of Kenneth J. Miller to Canadian-area merchandise manager at Calgary; of James Anthony Groves as field representative at Swift Current, Sask., Canada; of Joseph Harry Young as field representative at Virden, Man., Canada; and of Wesley D. Huston as field representative at Edmonton, Alta., have been announced by W. A. Weir, manager of U.S. Steel's Oil Well Supply Division's Canadian area.

Miller was employed by "Oilwell" in 1945 as a storeman in its Okotoks, Alta., store. He later served as field representative and store manager at that location and in 1949 was transferred to

Edmonton, Alta., as store manager. In 1951 he was named district merchandise manager at Edmonton, the position he held prior to his recent appointment.

Groves was employed in 1948 as storeman at "Oilwell's" Houston store. He was transferred to the division's Odessa store in 1949, and in 1950 was sent to Synder to serve as field representative. From 1950 until 1954, Groves served in the air force. He returned to the Swift Current store as storeman, the position he held prior to his present appointment.

Young was employed in 1954 in the Virden store and later in the year was transferred to Edmonton, Alta., to serve in the same capacity.

Huston was employed in January 1955 as a warehouseman at Edmonton, the position he held at the time of his new appointment.

Homco Opens New Store, Shifts Field Personnel

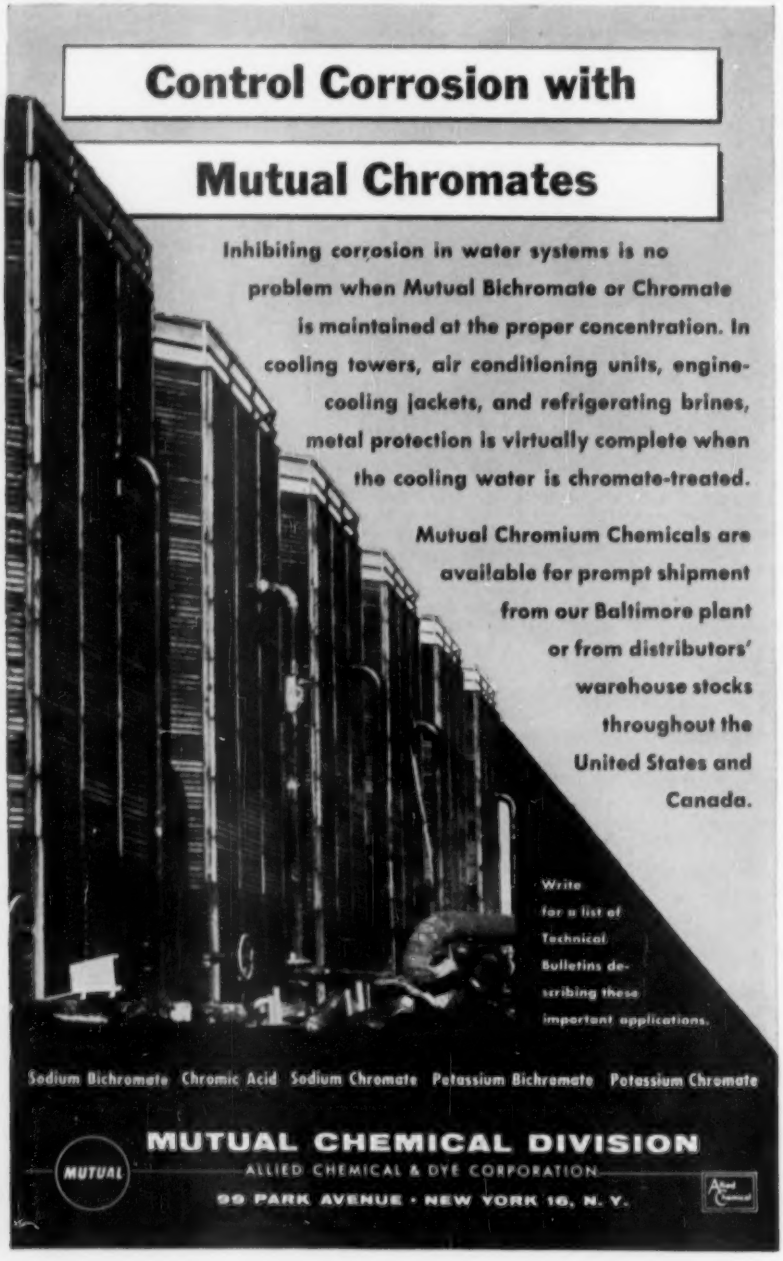
Houston Oil Field Material Co., Inc., will open a new sales and service tool store in Sherman, Tex., to serve the North Texas and southern Oklahoma area. In addition, Homco has announced the following personnel changes and promotions:

Hewitt N. Clark has been shifted from chemical sales to sales at Houston; Vernon C. Clark goes from Houston to directional-drilling engineer at New Iberia, La.; Ira L. Davis changes from directional-drilling engineer to assistant superintendent of directional drilling at Houston; Pat J. Dougherty jumps from salesman to division sales representative in Louisiana; and Wm. B. Hackett, lab technician, is promoted to lab supervisor at Houston.

Gordon E. Harrigan goes from Houston engineer department to sales and service engineer in Louisiana; Jackie B. Haynes shifts from Houston to Sherman, Tex.; Milleage Kitchens goes from Lake Charles, La., to Houston; Ralph J. Leonetti changes from Houston to sales and service engineer at New Iberia, La.; John C. Pruett goes from Houston to Sherman, Tex.; Ben H. Schnapp shifts from chemical sales to sales at Houston; and Jerry C. Smitha goes from Houston to Sherman.

The store at Sherman will have a complete stock of oil-field supplies and equipment. C. M. (Morris) Hart will be in charge of sales in that area. He has been residence manager in Tulsa for some 10 years.

J. O. (Bill) Redmon will be in charge of services at Sherman, with a staff of well-qualified supervisors and engineers.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Johnston Testers Names Deters to Export Sales

BRUCE DETERS

The appointment of Bruce Deters as service and sales representative in foreign fields has been announced by W. F. Bettis, vice president in charge of export, Johnston Testers, Inc., Houston. Deters had been with Johnston Testers since 1939. Prior to his new assignment, he was general service manager of U. S. operations. He has previously made special service and sales trips to the Middle East, South America, Canada, and Mexico.

Otis Opens Lindsay Office

Otis Pressure Control, Inc., has opened a district office in Lindsay, Okla., at 813 West Cherokee Place. Louie Payne and Raymond Fitzpatrick are in charge of the branch.

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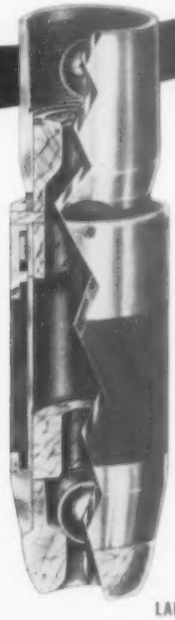

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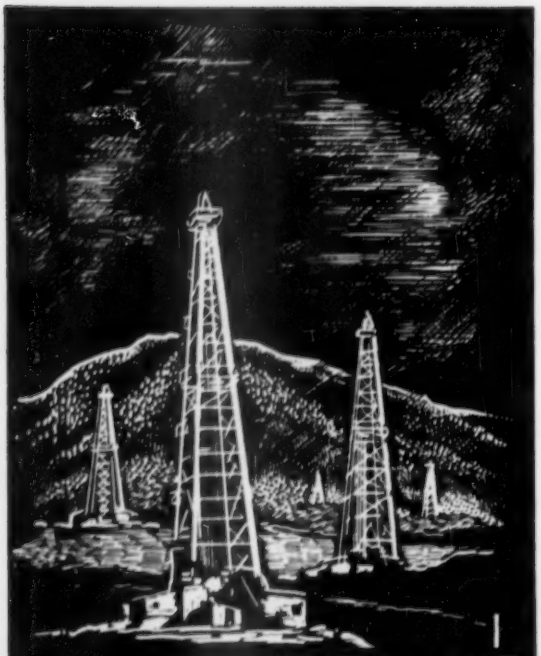

S. A. White, Supervisor, is another one of the executives on the IX roster with more than 20 years of geophysical survey experience. Starting with the company in 1933 after attending Texas Christian University, White has worked in every job on a field crew, including helper, shooter, scout, troop leader, and party chief. Men like White are "in charge" on every IX survey.

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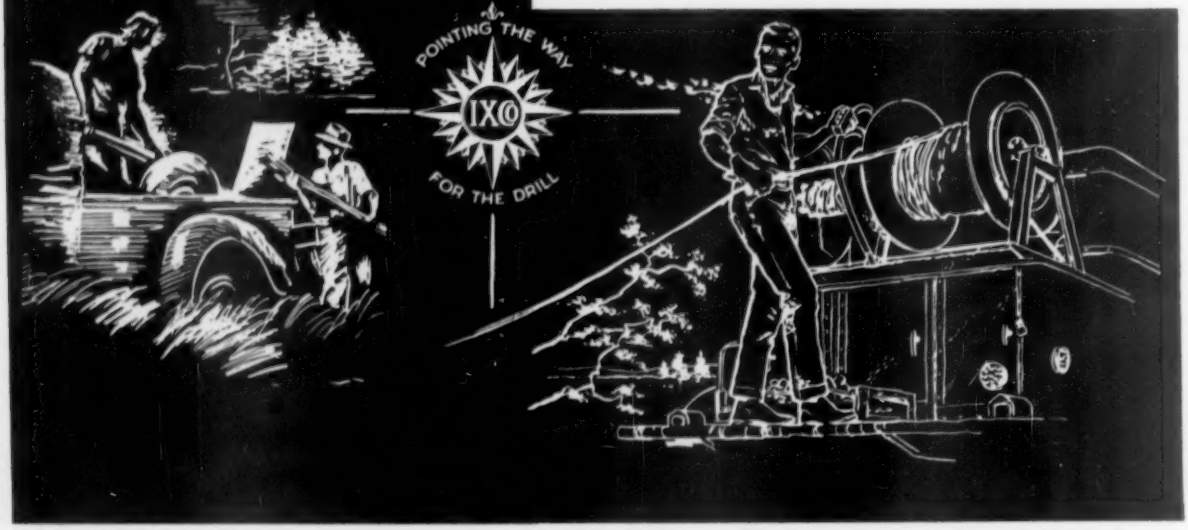

IX crews need no constant reminders on the importance of their field work. These crews have seen too many discovery wells brought in . . . entire new fields opened as the result of their geophysical surveys. They know that prior planning and attention to detail will help give an IX client a better "picture" of an area. Consequently, the "know-how" each crew has gained in years of field work pays off in a better survey for you. For a survey you can trust, call on experience — call IX.

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EXPLORATION

Southwest Texas Scores Twice

by Frank J. Gardner

EIGHT months ago, this column pointed to a new deep trend in Southwest Texas exploration. It lamented the snaillike pace with which the industry was feeling out the Paleozoic promise of the Edwards Plateau country and the Cretaceous chances along the western extremity of the major fault zones.

Today, two new strikes serve to emphasize these points. One is producing from the Paleozoics of the Edwards Plateau. The other flows from the Cretaceous at the western fault extremity. Both are important.

Wide vistas . . . They are important not because of prolific potentials, but because of the wide vistas of exploration they present the South Texas oil hunter. The upper reaches of the Rio Grande embayment have never been adequately tested. For 30 years, lonely wildcats in Maverick, Val Verde, Kinney, Zavalla, Dimmitt, and Webb counties have often underscored the possibilities there, but for some reason nobody's done much about them.

One of the largest potential producing structures in Texas is Maverick County's Chittim anticline. It was described as early as 1907 by surface geologists in the area. In 1925 Rycade Oil Corp. began the first serious wildcatting campaign on the arch. After a great deal of seismic work and 13 wildcats, Rycade succeeded in placing five good gas wells on production. They flowed gas and distillate from the Glen Rose-Lower Cretaceous at 5,500-5,600 ft. These were all on the 136,000-acre Chittim ranch; they were connected to Texas Gas Utility Co., which provided fuel to surrounding towns and cities from the field, and operated a small gasoline plant. But after the initial success by Rycade, further exploration lagged. Drilling records show little or no Maverick County activity in the past two decades.

This week, Continental Oil Co. completed an oil well on the Chittim ranch. It's the first oil for the county. From Austin - Upper Cretaceous chalk at 3,109-4,134 ft. (open hole), Continental 1 N. J. Chittim rated 157 bbl. of 28°-gravity oil per day on 18-in. choke. Accumulation is believed due to one of the many faults that cut the southeastern flanks of the broad Chittim arch, at the western end of the Mexia-Talco fault system. The new oil pool lies more than 10 miles southeast of the old gas field.

Two new discoveries in Southwest Texas open wide vistas for new exploration.

In two provinces . . . Nearly 100 miles to the northwest, and in a different geologic province, Phillips Petroleum Co. has opened a Strawn-Pennsylvanian gas-distillate reservoir in northeastern Val Verde County. The discovery, Phillips 1-A Cauthorn, flowed 42,000,000 cu. ft. of gas and 42 bbl. of distillate per day from Strawn perforations at 9,982-10,052 ft. and 10,174-10,262 ft. This strike is 5 miles southwest of Val Verde's first field, Vinegarrone, which was opened by R. J. Caraway in 1951 with a 35,000,000-cu. ft. gasser from the Strawn at 10,050 ft. The Vinegarrone wells lie on the southeastern flank of the south extension of the Midland basin, often called the Val Verde basin.

These two discoveries may lead at last to a serious effort to uncover the buried structures of the upper Rio Grande embayment and along the southern rim of the Permian basin country. Undoubtedly, there are many good oil and gas fields to be found in the 6,000 sq. miles of the Eagle Pass-Carrizo Springs district, and in the 9,000 sq. miles of the Edwards Plateau country. More immediate indication of this increased interest in the region is the offset campaign already under way by Continental at its Chittim strike, and the sinking of a 13,000-ft. test by Humble Oil & Refining Co. only a mile south of Phillips' Val Verde strike.

Sparsely drilled . . . Two factors should ease the search. First, this is an old province, productionwise. Geologists are thoroughly familiar with the section, its character, and the probabilities of production from each formation. A glance backward at development history in the older fields should provide the dope that will allow a lot of corner-cutting in exploration. Second, these large and sparsely drilled areas are known to be underlain by formations that produce in other areas. Skill in the search for structure is the final requirement for success.

The fault line extends promise of favorable structure and excellent hunting ground over a wide area of Southwest Texas, but history shows a slow pace as far as discovery is concerned. Just why this is so has long been a puzzle to observers in the area. A period of 13 years separated the Darst Creek discovery of 1929 and the next fault field strike at Imogene in 1942. Now the pace has quickened, but wildcatters have been prone to neglect the western fault zone.

Promise new fields . . . It is in such directions that the future of Southwest Texas' oil industry must lie. Recent activity in the area has settled down to probing for deeper pays on known structures; this, of course, is a logical and necessary program. But it's aggressive wildcatting that will find the new fields in virgin areas. And in a region of dwindling virgin areas, such encouragements as these should stimulate a spirited wildcat play.

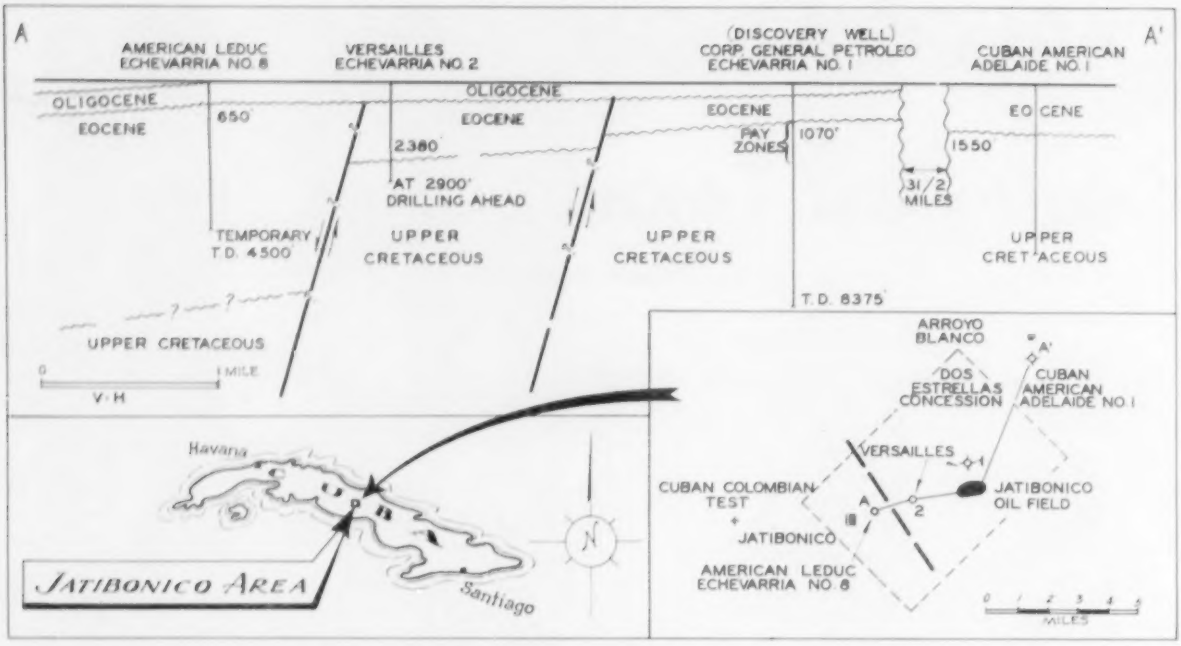

FIG. 1—Cross-section A-A' of Jatibonico oil field shows several possible oil traps. Notice the thick Eocene (Tertiary) section penetrated by American Leduc's 8 Echevarria. These prospects considerably enhance central Cuba's possibilities.

Outlook brightens as

Key Cuban Test Finds Tertiary Sands

by Harry Wassall

Here's an optimistic report on current developments in Cuba's active oil play. Analyzing the latest data available, the author concludes that exploration prospects are excellent.

A KEY Cuban test, located 2½ miles west of Jatibonico oil field, Camagüey Province, has found a 4,500-ft. section of Tertiary shales, marls, and sands which are comparable to Gulf Coast lithologies.

This test, American Leduc 8 Echevarria, is highly significant since it encountered for the first time a number of factors which will encourage increased exploratory activity in Cuba.

1. It proves the existence of a thick Tertiary basin in this area. Previous drilling to the southeast, in Trans Cuba's 1 Júcaro and 1 Algodones, found only 900 ft. and 1,100 ft. respectively of Tertiary above the upper Cretaceous volcanics and sediments. Cuban American's 1 Adelaide to the northeast found only 1,550 ft. of Tertiary.

2. It encountered an extremely attractive section for oil exploration, with three very porous sandstone intervals at 2,533-91 ft.; 2,809-3,343 ft.; and 4,127-4,241 ft.; a total of nearly 600 ft., eliminating shale breaks. These sandstones must be unconsolidated because only individual rounded grains of medium-to-coarse-size quartz and porphyry are present in the cuttings. Other sandstones or conglomerates may be found below 4,500 ft.

3. This test indicates major relief on the pre-Tertiary unconformity surface which is best explained by faulting. This faulting has a throw of more than 2,000 ft. and may either be post-Eocene or contemporaneous with Eocene deposition. The direction of this fault will not be known until more subsurface control is available.

4. It offers possibilities of accumulations where the sandstones in the basin either terminate against a fault, change facies to shale, or overlap the pre-Tertiary unconformity. At the moment, the best possibilities appear to lie between this test and the Inversiones Petroleras Versailles 2 Echevarria, where the sandstones are missing from the Eocene. However, further drilling will probably reveal many other favorable structural and stratigraphic situations.

5. Lastly, this test suggests that a possible source of the oil being produced in the Jatibonico field from the fractured Upper Cretaceous volcanic section, may be seepage from Tertiary reservoirs which are structurally lower.

This test in Lot 32 of the Dos Estrellas concession was contracted by the C. J. Simpson Drilling Co. and

THE AUTHOR

Harry Wassall, a consultant geologist, Havana, Cuba, was with Gulf Oil Co. in Cuba for 4 years. He was acting as Gulf's chief geologist at the time of his resignation. Prior to his Cuban experience, Wassall was a subsurface geologist with Shell Oil Co. in Wichita Falls, Tex.

drilled with a trailer mounted National T-32 rig. It spudded on March 30, 1955 and reached 4,500 ft. with an 8¾ in. hole in less than 5 days, including time spent setting surface casing. The hole has been temporarily abandoned until a string of lighter weight drill pipe can be brought in to deepen it.

More wells planned . . . The Tertiary sediments can be drilled at rates of 50 to 150 ft. per hour, whereas the underlying Upper Cretaceous contains thick, porphyritic flow rocks which slow down the drilling to as little as 2 ft. per hour and wear out bits in 50 ft. Therefore, this Tertiary basin will probably see a number of tests within the next few months because it is much cheaper to explore and offers better possibilities than the structurally complex, predominantly volcanic Upper Cretaceous section.

The first of these tests—a joint venture by Cuban Colombian Oil Co., Pacific Petroleum, and others—will be located north of the Central Highway about 5 miles west of the town of Jatibonico. Another location will probably be made by the Cuban American Drilling & Exploration Co. (Grady Vaughn et al) which controls most of the acreage adjoining the Dos Estrellas concession.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

KANSAS

Lansing Discovery Seen For Kiowa County Area

Gramehart-Miller 1 Barnes "D," NE NE NE 21-27s-19w, is an indicated Lansing discovery for Kiowa County, 8 miles northwest of Greensburg.

The wildcat recovered 400 ft. of gassy oil and 60 ft. of muddy oil on drill-stem test in the Lansing lime at 4,348-62 ft. The operator is drilling in the Mississippian. This discovery prospect is located 7 miles southwest of Edwards County's Sturgeon field.

Testing Due at Graham Discovery

Pipe is set for testing at a new Graham County discovery in SW SW SE 31-9s-22w. The well showing for discovery is K&E Drilling Co.-Century Refining Co. 1 Sutor.

A drill-stem test in the Lansing lime at 3,790-3,810 ft. got 1,135 ft. of oil. This wildcat venture is located 1 mile southwest of the 1 Farriel, SE SE NW 32-9s-22w, discovery well of Red Line field. This well is waiting for its potential test.

OKLAHOMA

Continental Active West Of Short Junction Field

Seismic work is picking up through 9n-4w, 10-4w, and extending into 10n-5w by Continental crews. The firm has had good success in its West Short Junction field, Cleveland County. Flow potentials of more than 1,000 bbl. per day have been obtained at Hunton lime wells in the field.

Davis Area Wildcat Recovers Oil On Test

Frankfort Oil Co. reported an oil recovery on drill-stem test at 4,016-28 ft. in sand at its 1 Baldwin, SE NW NE 4-1s-1e, Murray County wildcat.

Recovery was 95 ft. of oil-cut mud. The firm has an indicated discovery in the area north of the Arbuckle Mountain front at 1 Hale, SW NE 4-

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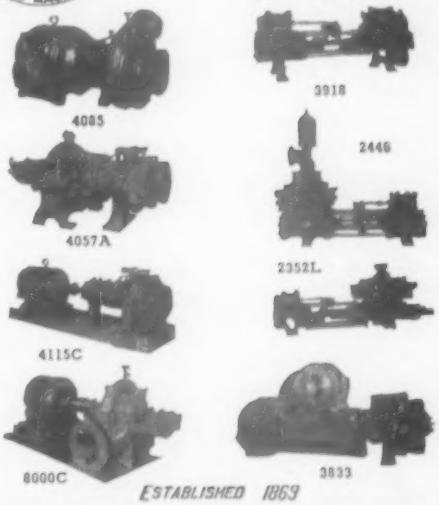

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1s-1e. Commercial oil was reported there on drill-stem tests in the Arbuckle lime.

Skinner Gas Well Added To North Mount Vernon

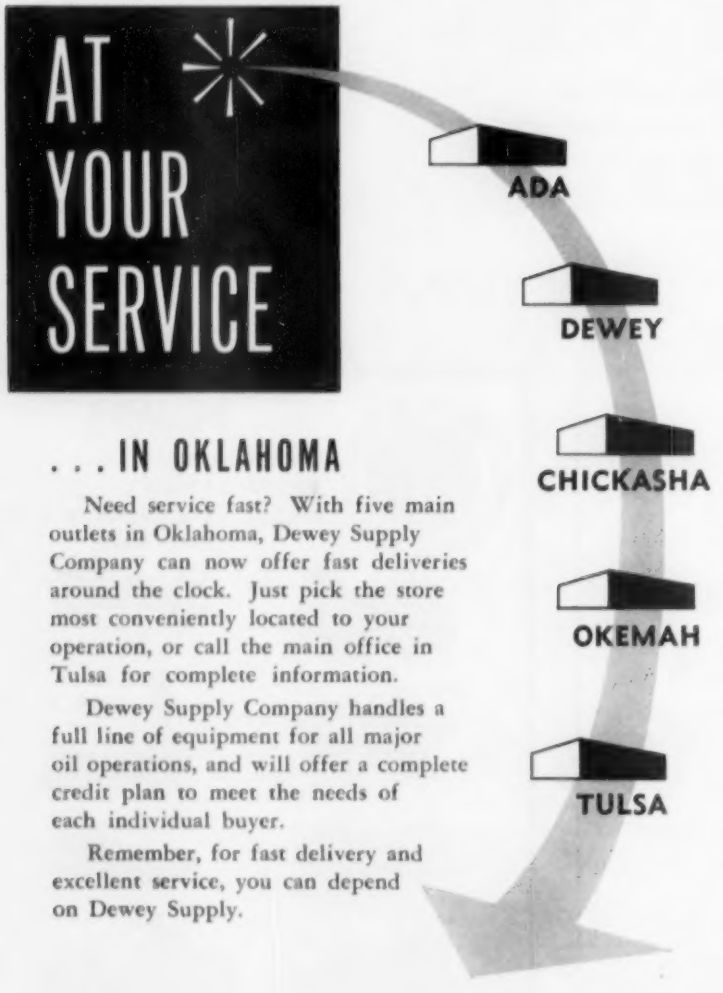
Lincoln County's North Mount Vernon field in central Oklahoma has added a Skinner sand gas well. It is Globe Oil & Refining Co. 1 Scott, NE SE NW 26-16n-3e. The well flowed 5,200 M.c.f. per day on choke from perforations in the Skinner sand at 4,145-50 ft.

The Texas Co. has an oil well in the making at 1 Adams in SW SW NE 26. The well got oil at 4,163-68 ft., flowing 98 bbl. per day. Tide Water Associated Oil Co. is drilling in SW NW SE 26 at 2 Black.

Bromide Being Tested At Northeast Bradley

Production tests are under way at Superior Oil Co.'s 1 State in C SE SE 2-5n-5w, Northeast Bradley field extension well in Grady County.

The well flowed 464 bbl. of 47.1°-gravity oil in 24 hours through 13/64-in. choke from perforations in the Bromide sand at 13,005-55 ft. Gas-oil ratio is 1671:1. The Tulip Creek sand at 13,261-330 ft. also indicated commercial possibilities on small choke.



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HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Dvelopment Underway in New Interstate Pool Pay

Stanolind Oil & Gas Co. is developing a new pay in Interstate pool, Morton County's sole oil-producing area.

The 1 Kansas City Life, 30-34s-43w, pumped 19 bbl. of 40°-gravity oil per hour on a 3-hour test through perforations at 4,454-60 ft. in the basal Morrow sand. This is the first basal Morrow production in this pool. The company holds leases on 480 acres in the immediate area. The Interstate pool is just south of big Greenwood gas field.

TEXAS PANHANDLE

Gray County Wildcat Gets Shows in Simpson Zone

A possible new pay for the Gray County area of the western Anadarko basin in the Texas Panhandle is the Simpson.

Shamrock Oil & Gas Corp. 1 Byrum, Section 47, Block M-2, H&GN Survey, recovered 100 ft. of oil and gas-cut water on a drill-stem test at 12,944-70 ft. plus 3,360 ft. of very slightly oil and gas-cut water blanked, and 180 ft. of gas-cut and slightly oil-cut muddy water blanket, plus 90 ft. gas-cut and very slightly oil-cut mud. Another drill-stem test taken previously at 12,944-60 ft. also had shows.

OKLAHOMA PANHANDLE

Two Discoveries Finaled In Beaver County Area

Two important discoveries are complete in Beaver County. Cabot Carbon Co. 2 Hodges, NW NE 1-5n-25eCM, north offset to Northwest Mocane field, flowed 192 bbl. of oil daily on 14/64-in. choke from perforations in the Kansas City lime at 4,787-92 ft. This is a new-pay discovery for the field and for the Panhandle. Nearest such pay is at Greenwood field in Morton County, Southwest Kansas. The well also has production in the Permian-Council Grove, and the Pennsylvanian Toronto, Lansing, and Checkerboard pays.

Cabot 1 Judy, NE SW 1-5n-24eCM, southwest offset to the discovery well of Northwest Mocane field, flowed 4,750 M.c.f. of gas per day following

treatment from Morrow sand at 6,204-10 ft. This well also has indicated Toronto and Mississippian production. Salt water was encountered in the Checkerboard pay zone.

New field names . . . Northeast Forgan pool is the name for the producing area at Lion Oil Co. 1 Hodges, SW NE 21-6n-24eCM, new Permian gas discovery in Beaver. South Glenwood field is the name given to Parker 1 Hennigh, NW NW 28-6n-28eCM, Morrow gas-distillate discovery area.

ARK-LA-TEX

EAST TEXAS

New Work Slated For Gregg County

Locations have been made for two wildcat tests near the Lena Alma-Woodbine field in Gregg County.

Carl Bruce and Sam F. Jordan, Gladewater, 1 Alice Jeffrey is projected to 7,000 ft. to test the Pettit limestone. Location is in Stephen Winship Survey, A-243, and lies 8 miles northwest of Kilgore.

John M. Banter, Longview, 1 G. S. Smallwood, is in Stephen Winship Survey, 4 miles south of Gladewater. Contract depth is 3,700 ft.

WEST TEXAS-NEW MEXICO

SOUTHEAST NEW MEXICO

Lea County Discovery Finds Water Table

Water table in the Devonian was reported at Amerada Petroleum Corp. 1 State SRA, dual discovery 10 miles north of the town of Caprock.

Third test in the Devonian was from 11,152-77 ft. In 4 hours recovery was water blanket cut with oil, 30 ft. of oil and 2,457 ft. of salt water. Gravity of the oil was 35.6°. Initial test of the Devonian, at 11,102-27 ft., developed 15 ft. of free oil. At 11,127-52 ft., operators reversed out 121 bbl. of 41° oil, with no formation water.

This well also flowed 37 bbl. of oil an hour on drill-stem test in the Pennsylvanian from 9,105-9,260 ft. Location is in SE SE 14-9s-32e.

WEST TEXAS

Cottle County Prospect

Cottle County had prospects of a second well in the new area 11 miles southwest of Paducah. General Crude Oil Co. 12-1-B Swenson, SW NW Section 12, Block B, John H. Stephens Survey, developed 1,050 ft. of free oil and 150 ft. of heavily oil and gas-cut mud on drill-stem test at 3,237-42 ft. Flowing pressure ranged from zero to 175 psi.

This area attracted attention last month when Sequoia Oil Co. 1 Wilie gave the county its first commercial oil production. Pumping potential was 20 bbl. a day from Flippen (equivalent to lower Wolfcamp or Cisco) limestone at 3,234-39 ft. General Crude 12-1-B Swenson is ½-mile south offset to the discovery. Development around the discovery resulted in dry holes to the east and southwest of 1 Wilie.

Cottle County's only producing well had prospects of an offset extension last week.

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Dual Discovery Completed In Runnels County

Runnels County gained a dual discovery well, 4½ miles west of Winters. W. W. West, Midland, 1 Lillie Fennell was originally scheduled as an Ellenburger exploration, but finished as a good producer from King sand and a Pennsylvanian reef.

Initial potential from King sand was 198.75 bbl. of 43.7° oil a day, through ¼-in. choke, from perforations at 2,764-74 ft. Casing pressure was 150 psi.

Potential from the reef was 226.65 bbl. of 43.8° oil, through ¼-in. choke from perforations at 2,929-49 ft. Gas-oil ratio was 928:1. Flowing pressure was not reported, but gaged 570-645 psi. when flowed on a drill-stem test. Top of the reef was 2,790 ft.

Location is in Section 72, Block 63, H. N. Baggs Survey. Nearest production is over 1 mile to the west in Poe field, but dry holes separate the two areas.

Terry Extension Flows

Midwest Oil Corp. and White Eagle Oil Co. 1-A Guetersloh, ⅜-mile south extension to Northeast Adair field, flowed oil on two tests in the Wolfcamp. When completed, 1-A Guetersloh will be the fourth well in the field.

Sample top on the Wolfcamp was 8,808 ft., minus 5,589 ft., which checked 16 ft. high to the field discovery, but 8 ft. low to nearest production. A test at 8,810-46 ft. had oil in 45 minutes. It flowed to clean for 19 minutes, then tanked 13.35 and 14.58 bbl. of oil in two 30-minute gages. Flowing pressure ranged from 640-2,000 psi.

After coring ahead, a test at 8,837-71 ft. had oil in 36 minutes, and gaged 27 bbl. of oil in 1 hour, with no water. Maximum flowing pressure was 2,120 psi.

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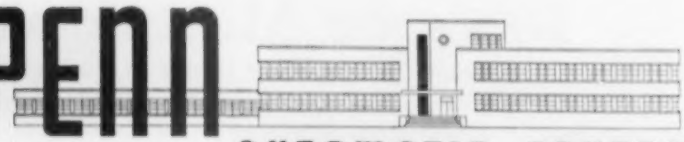

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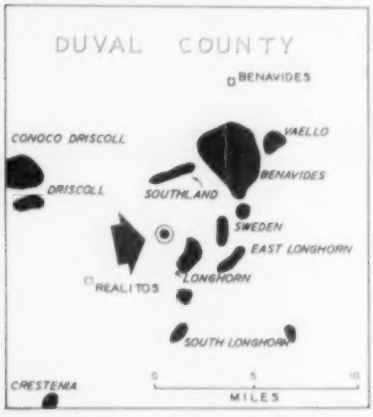
GULF COAST

SOUTHWEST TEXAS

Duval County Wildcat To Make Teddlie Well

M. M. Miller & Sons are completing their 1-E Miller fee, wildcat test 5 miles northeast of Realitos, in Duval



Arrow points to M. M. Miller & Sons' new Teddlie-sand oil-discovery well, northwest of Longhorn field, in South Central Duval County.

County, as an oil producer in the 4,550-ft. Teddlie sand they passed up several weeks ago for deeper exploration.

Hole has been plugged back to that sand after having been drilled to 5,435 ft. without finding any additional indications of commercial production.

A drill-stem test at 4,551-56 ft. in the Teddlie sand got 1,400 ft. of pipeline oil plus 100 ft. of oil-cut mud, filling through ¼-in. choke in 15 minutes with working pressure of 73 psi.

Location is more than 1½ miles northwest of Longhorn field, nearest production.

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W. G. Simpson, Drilling Superintendent, Clyde Hall Drilling Company

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DRILLING COMPANY

Contract Oil Well Drilling

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Box 107, Station B
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March 12, 1955

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Reed Roller Bit Company
1330 30th Street
Bakersfield, California

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We are pleased to report the following data on a string of 4½" drill pipe in service for approximately four years.

This string of pipe was equipped with 4½ x 6" O.D. F.H. Reed Super Shrink-Grip tool joints and we have drilled approximately 240,000 feet of hole before having them replaced.

We are also users of Reed flash welded tool joints. Our service from Reed flash welded joints is outstanding, the same as with Reed Super Shrink-Grip.

Yours very truly,

CLYDE HALL DRILLING COMPANY

By W. G. Simpson

W. G. Simpson

WGS:hp

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Chalk Production Opened In Hindes Navarro Field

Austin chalk production, objective of an active exploration along the Pearsall trend through central Frio County, is being extended to the small Hindes field, in the southeastern part of the county.

Hindes field, discovered in 1951, has been productive from the shallower Navarro formation about 5,600 ft. Chalk production, discovered by The Texas Co. at its 1-B Kothman NCT-2, is from perforated interval at 7,336-87 ft.

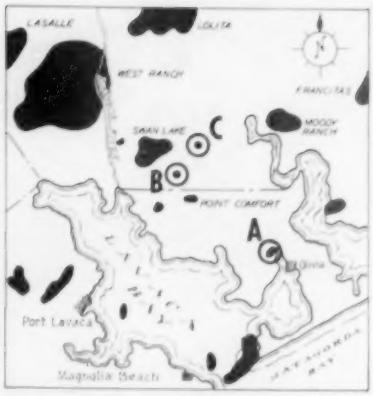
Flow of the discovery well was gaged at 105 bbl. per day, net oil, plus 22 per cent water, through 5/32-in. choke with pressure of 150 psi. Gas-oil ratio was 236 cu. ft. per barrel. Gravity of the oil is 24°.

Hole was drilled to 8,500 ft. and plugged back to 7,485 ft.

TEXAS GULF COAST

Lavaca Bay Area Gets Another New Discovery

Layton Brown is opening a new oil field on the north side of Lavaca Bay, in northern Calhoun County. It is the third new-field discovery in that area, bordering the Calhoun-Jackson county line, within the past 2 months.



Section of northern Calhoun and southern Jackson counties showing locations of three new-field discoveries: (A) Laytown Brown 1 Traylor; (B) Southern Minerals Corp. 1 McDowell; and (C) R. E. Hibbert 2 Hensley.

The new discovery well, 1 Traylor ("A" on accompanying map), just northwest of Olivia and 10 miles northeast of Port Lavaca, flowed at the rate of 182 bbl. of oil per day during a preliminary drill-stem test with ¼-in. and ⅛-in. chokes. Flowing pressure gaged 1,300 psi. The test was of lower Melbourne (Frio) sand, perforated at 8,331-35 ft.

Location is about 6 miles southeast of a gas-condensate discovery well completed by Southern Minerals Corp., early in March. In turn, Southern Minerals' discovery is about 2 miles southwest of an oil-discovery well completed by R. E. Hibbert the previous week.

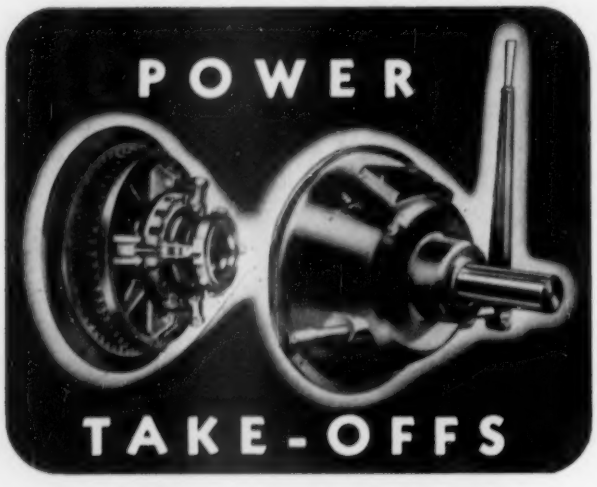
Both of these are on the Jackson County side of the line, southeast of Swank Lake field. The former, 1 McDowell ("B" on map), had a potential rating of 74,000,000 cu. ft. of gas per day with a gas-liquid ratio of 34,800 cu. ft. per barrel, producing from perforations at 7,442-46 ft.

Hibbert's discovery well, 2 Hensley ("C" on map), good for 198 bbl. of oil daily through ⅛-in. choke, produces from sand-interval at 8,734-40 ft.

New Cockfield Production Opened in Kuhlman Area

Federal Royalty Co. has a new oil-discovery well in northern Harris County. Its 1 Fuchs, 3½ miles west of Spring and about 1½ miles south of the Montgomery County line (Spring River), has proved productive in Cockfield sand, perforated at 5,886-92 ft. with hole plugged back from drilled depth of 6,256 ft. Oil flow through 5/32-in. choke was at the rate of 91½ bbl. per day with pressure of

ROCKFORD



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275 to 300 psi. and gas-oil ratio of 534 cu. ft. per barrel. Gravity of the oil checked 36.2°.

Location is in the midst of a concentration of fields in northern Harris County and southern Montgomery County in which the main production is from Cockfield sand. Nearest production is in the Kuhlman-Bender area, about 2 miles to the east. It is about 20 miles north of Houston.

Deeper Sand Opened in New Victor Blanco Field

Houston Oil Co. has completed its second well in its recently opened Victor Blanco field, in eastern Harris County, in a deeper sand than that of its discovery well.

The deeper sand, perforated at 8,795-8,802 ft., is productive of gas and condensate. Open-flow potential production is placed at 2,000,000 cu. ft. of gas daily with a gas-condensate ratio of 49,000 cu. ft. per barrel. Gravity of the liquid is 47°. Shut-in pressure of the well is 3,219 psi.

The well, 2 Swilley, is about 1,930 ft. northwest of the discovery well (1 Swilley), completed last February flowing 45½ bbl. of 45°-gravity oil per day through 5/32-in. choke from perforations at 8,130-40 ft.

The area is about 4 miles northwest of Sheldon, and about 15 miles east of Houston.

SOUTH LOUISIANA

Abandoned Test Becomes Beauregard Discovery Well

Justiss-Mears Oil Co. and Winston L. Stokes have made a good gas-condensate well at their Husser-Davis wildcat 4 miles north of DeQuincy, in southern Beauregard Parish.

The well is completed in Cockfield sand with perforations at 8,455-60 ft.

DeQuincy area of northern Calcasieu and southern Beauregard parishes showing location (arrow) of Justiss-Mears Oil Co. and Winston L. Stokes discovery well.

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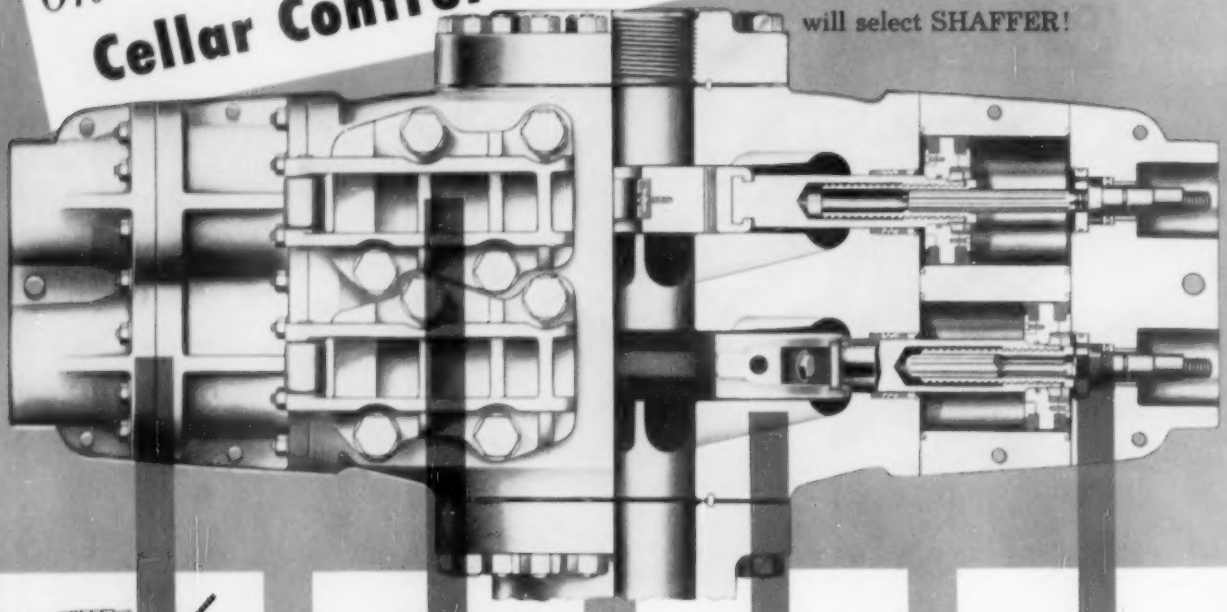

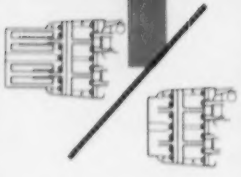

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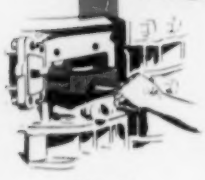
Some operators like the extra compactness of a non-rising stem on the locking screw—others prefer the quick indication of ram position afforded by a rising stem. Take your choice—Shaffer, and **only** Shaffer—provides your choice of whichever design **you** prefer. Note that built-in body extensions guard each stem in all positions. The stem—whether rising or non-rising—is never exposed beyond the body where it might become bent or damaged.



Simple Ram Changes

To change rams in Shaffer Hydraulic Gates you simply unbolt and swing open two side doors, slide out the ram assembly, change rams, replace the assembly and bolt the doors. Closing the doors automatically aligns the rams within the gate body. And whether pipe is in or out of the hole, rams in **either** compartment can be changed with equal ease. There's no need to dismantle the upper compartment to change rams in the lower compartment—or vice versa!

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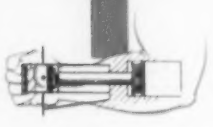
Shaffer rams travel on high, narrow guide ribs above the steeply-sloped ram compartment bottoms. Mud and sand quickly drain back into the well—leaving no detrimental accumulations to interfere with free opening and closing of the rams. This assures quick, easy ram operation and simpler maintenance. In addition, since well pressure is free to flow to the back side of the rams, it actually assists in the closing and sealing action of the rams.



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after having been drilled to 9,010 ft. Its potential gage through 5/32-in. choke was at the rate of 155 bbl. of 62°-gravity condensate and 1,350,000 cu. ft. of gas per day. Pressures were 2,715 psi., flowing, and 2,925 psi., shut in.

Location is slightly more than 1 mile southwest of Oretta field, discovered in 1945, and now productive from Eocene sands ranging in depth from 4,400 to 8,700 ft.

The well had been reported as dry and abandoned last January.

EASTERN INTERIOR

ILLINOIS

In Saline County Donald L. Foote 1 May Communitized, NE SE NE 34-8s-6e, 3 miles north of Harrisburg, has been completed in the Waltersburg sand at 2,045-54 ft. The well flowed 100 bbl. per day.

● In Jefferson County, 6 miles south of Centralia, Mutual Oil & Gas Co. 1 J. A. Wacker, NW SE NW 30-1s-1e, made 150 bbl. per day, natural from the Cypress sand at 1,775-84 ft. The well is 3 miles from Cypress production.

WESTERN KENTUCKY

Gene D. Manno recently completed a Jackson sand oil discovery 1½ miles from nearest production near Apex field in Christian County. The well produced 20 bbl. of oil natural from the Jackson sand at 567-87 ft. It pumped 85 bbl. in 12 hours after 50 qt. shot. Contractor was Luther McIntosh.

INDIANA

In Posey County, 10 miles southwest of Mt. Vernon near the Ohio River, S. C. Yingling 10 Maggie Murphy, SE NW SW 21-8s-14w, is swabbing and flowing 40 bbl. of oil per hour or at the rate of 960 bbl. daily from the Cypress sand at 2,257-99 ft. This prolific new area has six pay zones with five operators active.

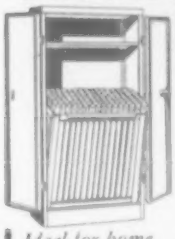
GREAT LAKES

MICHIGAN

Northville Gas Due for Delivery By June 1

Gas from Trenton wells in Northville pool, Washtenaw and Wayne counties, should be on a regular delivery schedule to Consumers Power Co. on or before June 1.

AVAILABLE AGAIN!



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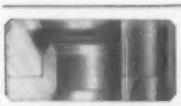

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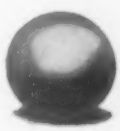

"Ceramic" Ball
Nearly as hard as a diamond. Non-corrosive and non-magnetic.

"Stainless Steel" Ball
For ordinary pumping where little trouble is encountered.

The State Advisory Board, following a public hearing in Lansing on April 22, recommended that Supervisor of Wells Eddy, explore, with the Michigan Public Service Commission, a program which will allow the production of Trenton gas from Northville field wells.

Originally, the field was classified as a Trenton oil pool. A proration schedule was established and is still in force. This proration allows wells to produce a maximum of 400 bbl. of oil per day from the Trenton. Gas-oil ratio cannot exceed 1,000 cu. ft. of gas per bbl. of oil. The W. C. Taggart 1 LeMaster, discovery oil well, is the only well in the pool (of 18 producible Trenton-Black River oil and gas wells completed) which has been capable of producing the maximum oil allowable with an allowable oil-gas ratio. This well on last tests run late in March showed a gas-oil ratio of 2,000 cu. ft. of gas per barrel of oil at a flow rate of 200 bbl. per day. Well was shut in. Gathering system for gas is about completed in the area, and the Consumers Power Co. has indicated that it can accept from 7 to 10,000 M.c.f. of gas per day from the Taggart Co. at its Northville station. The field has 8 Trenton gas wells.

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APPALACHIAN

WEST VIRGINIA

In Union district, Preston County, West Virginia, Columbian Carbon Co. 1-1207 Lawrence Burger et al, rank wildcat, elevation 2,543 ft., recording the Oriskany sand at 4,981 ft., with gas in the top testing 268,000 cu. ft., was Hydrofraced and now gages 1,524,000 cu. ft. Drilling is continuing in this formation and is at 4,997 ft.

• Licking district, Tucker County, Hope Natural Gas Co. 9924 Alex Nestor heirs, is drilling at 5,023 ft. The last reported formation was the Oriskany sand, topped at 4,644 ft.

• Circleville district, Pendleton County, Columbian Carbon Co. 2-1203 U.S.A. is drilling at 6,323 ft. in the Oriskany sand which was reached at 6,261 ft.

OHIO

The first test to extend the productive area in Milton Township, Wayne County, using rotary tools, was successful. Slagter Producing Co. 1 Martha Conrad, Section 20, with oil showings in Clinton at 3,269-79 ft. and 3,314-25 ft. made 90 bbl. in a 24-hour test after fracturing.

• A south extension of ¼ mile to the pool in southeast Fallsburg Township, Licking County, made 150 bbl. in 24 hours after treatment. Completed by Ulmer & Son on 1 C (10) Zelda Ashcraft, Section 21, Clinton was logged at 3,002-3,053 ft. with a fair oil and gas showing natural.

• In Ewing pool in Washington Township, Hocking County, H. D. Collins et al reported the Clinton at 2,856-92 ft. with an oil showing on the C. A. Marks 1 (3), Section 12. Three weeks after fracturing, a 24-hour test produced 50 bbl.

EASTERN KENTUCKY

On Lunce Branch in Clay County, United Fuel Gas Co. has completed their wildcat 4 Fordson Coal Co. as a gas producer. Producing horizon is the Mississippian Big lime topped at 1,660 ft. and bottomed at 1,731 ft. TD 1,734 ft. Well gaged on open flow 381,000 cu. ft. of gas daily after being shot with 250 lb. of dynamite. A 48-hour rock pressure showed 338 lb.

• On Coon Branch and located in the Pike County sector of Big Sandy gas field, United Fuel Gas Co. has completed 8,298 Elbert Hatfield as a Big lime producer with an open flow potential of 2,316,000 cu. ft. of gas daily after acidization with 3,500 gal. Big lime was topped at 2,465 ft. Total depth 2,701 ft.

PACIFIC COAST

CALIFORNIA

Six-Year Old Coalinga Field Yields Shallower Flush Pool

The new Sanger sand (lower Miocene) uncovered by tests ½-mile southeast of production at Guijarral Hills also has been found to be present in an up-structure well in the Fresno County field. Sunray Oil Corp. 2-76-34 Fred Smith, originally completed in the 8,250 ft. Allison sand 6 years ago, was recompleted as the discovery of the shallower pay. Initial production from the 7,885-7,908 ft. interval was 516 bbl.s of 35°-gravity crude daily.

Recent activity in the Polvadero area near the center of 1-21s-16e, 1½ miles southeast, indicated the Sanger was productive there. Although none have been completed in the Sanger sand, three producers in the 10,500-ft. Gatchell sand (Eocene) have either tested productive in the interval or have been logged as being possibly productive. Up-structure location of the discovery indicates the shallower pay may have been overlooked in other Gijarral Hills producers when they were completed some 6 years ago.

In the Polvadero area Los Nietos Co. was preparing to start 46 Bourdieu as a southwest offset to its "55" Gatchell sand discovery. Its 75-1 Bourdieu, two locations east of the discovery, was completed flowing 1,126 bbl. of 30° gravity crude from 10,730-10,850 ft. Flow was thorugh a 1-in. choke and was accompanied by 500 M.c.f. of gas.

Tejon Pool Extended

Reserve Oil & Gas Co. successfully redrilled a ½-mile northeast extension to the two-well Jewett pool at its Tejon Ranch properties in southeast San Joaquin Valley. Its 12-34 Reserve Pauley in NW NW 34-11n-19w, flowed 700 bbl. of 35-gravity crude through a ¼-in. choke, producing through perforated intervals between 7,190 and 7,267 ft. The well, after testing gas in this zone prior to being drilled to 11,687 ft. in search of Vedder (Lower Miocene) production, had been plugged back and redrilled downstructure to the northwest.

Deep Ventura Test Suspended

Lloyd Corp., Ltd. suspended its deep 1 William Sexton on the eastern edge of Ventura Avenue after months of testing deep possibilities. Originally completed in 1951 at a 13,058 ft. total depth, the wildcat last June was plugged back and redrilled to 16,492 ft. After

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J. M. PATTINSON, C.B.E.

E. H. Tanner, President of Triad Oil Co. Ltd. announces the appointment to the Triad Board of Directors of J. M. Pattinson, C.B.E., a Managing Director of The British Petroleum Company Limited, London. Mr. Pattinson will represent British Petroleum on the Triad Board.

(Advertisement)

a lower interval tested wet hole was plugged back to 15,035 ft.

OREGON

Oregon Test Starts

Standard Oil Co. of California was getting under way with its wildcat near the month of the Columbia River in

A new wildcat is under way in the Oregon-Washington Pacific Coast area. It is Standard of California 1 Hoagland Unit near the mouth of the Columbia River, 10 miles southwest of Astoria.

northwest Oregon. Site is about 10 miles southwest of Astoria. Reported depth scheduled for 1 Hoagland Unit is about 9,000 ft.

WESTERN CANADA

ALBERTA

Gas Flows at Wildcat In the Smoky River Area

Richfield Oil Corp.-Canada Cities Service Petroleum Corp.-Sinclair Canada Oil Co. team's driller in the Smoky River area of northwestern Alberta recorded a moderate flow of gas in the Cadomin formation.

This well, Richfield et al 9-20 Smoky River, LSD 9, 20-66-4w6, is located 30 miles southwest of Grande Prairie and 215 miles northwest of Edmonton.

SASKATCHEWAN

Production Casing Run at Hilldale Area Prospect

Canso Oil Producers, Ltd., has run casing at its wildcat in the Hilldale area in southwestern Saskatchewan after indicated commercial production of Viking sand gas.

The well, 7-19 Hilldale, LSD 7, 19-32-27w3, flowed gas at maximum rate of 1,300 M.c.f. per day on drill-stem test. This strike is 4 miles north of Canso's 6-31 Hoosier potential Viking gas producer.

MANITOBA

Souris Valley Begins Drilling Program in Area

Souris Valley Oil Co., Ltd., a Manitoba oil company, has completed farmout arrangements on about 8,240 acres in southwestern Manitoba province and has under negotiations other additional farmouts.

Present agreements call for nine wells to be drilled this summer along the general trend running from Alida and Nottingham fields of southeast Saskatchewan through the Pierson area of Manitoba to the North Westhope field of Bottineau County, North Dakota. Production has already been obtained in the Pascar well in this trend.

Five blocks have been farmed out to Anglo-Canadian Oil Co. and associates and surface casing has been set on the first well, Anglo et al 1-22 Souris Valley-Shannon, LSD 1, 22-2-28w1. Drilling operations were suspended on April 2 due to road bans. Drilling will begin as soon as the road bans are lifted. Other locations in this group include a test on LSD 1, 8-3-29w1, 2½ miles west of Person field; and tests in 2-27, 1-26, 1-25w1. These wells will go to the Mississippian and may be carried deeper if structural conditions warrant.

Lone ★ Star BOATS

26 FT. SHALLOW DRAFT
All-Aluminum
GEOPHYSICAL BOAT

A seaworthy 26' craft with excellent maneuverability — Single engine operational simplicity and economy but with response comparable to twin screw operation. Built by the nation's largest aluminum boat manufacturer. Tunnel stern prevents damage to screw or rudder in shallow water operation. Maneuvers in only 12 inches of water. Roomy, insulated cabin makes craft ideal for geophysical operations where low noise levels are essential. Unusually low priced. Immediate delivery available.

For full details and inspection, contact

Lone Star Boat Manufacturing Co., Inc.

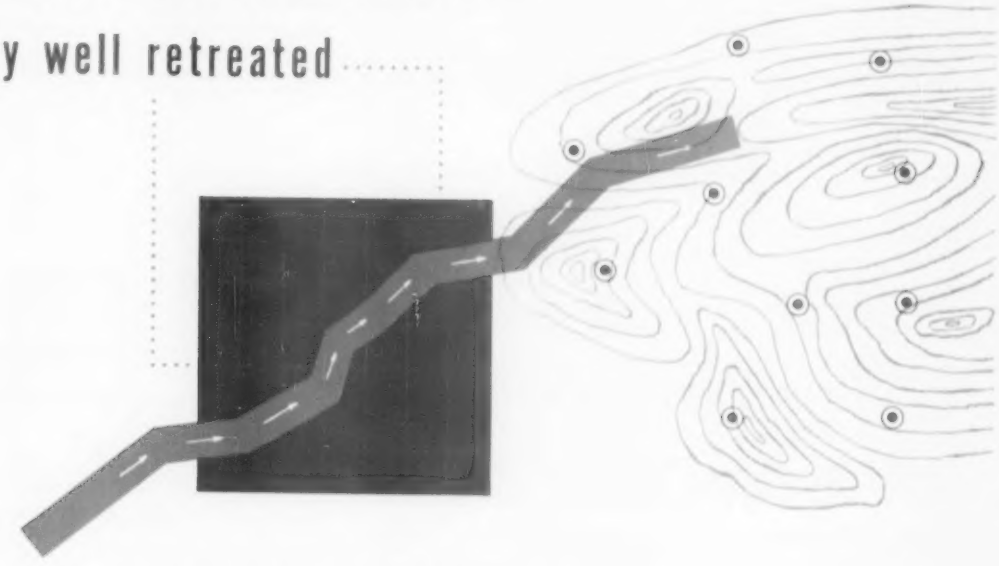
Box 698, Grand Prairie, Texas

SPECIFICATIONS

Gross Weight	3000 lbs.
Length, overall	26'
Max. Beam	8½'
Max. Draft	12"
Freeboard	2½'
Cabin Area	8½' x 6½'
Cabin Height	6' 2"
Gasoline Capacity	90 gal.

Machinery:
Graymarine Phantom 4-75
75 hp.; 3500 rpm

production boosted in most every well retreated



with HALLIBURTON'S delayed action *Acidfrac*

Acid retreatments in wells that have produced for some time and gradually declined are not usually successful. Acid merely re-enters the old channels that are already large enough to permit all flow from the formation pressure. Now, Halliburton's Delayed Action Acidfrac, a special service that combines the effectiveness of fracturing and acidizing, creates *new* flow channels in *new* areas or extends channels further away from the bore wall. With this entirely new action, Acidfrac has established an amazing field record of boosting production in virtually every retreated oil or gas well!

A thickened emulsion containing acid was developed to give a longer period of reaction over a wider drainage area—three to four hours is usually required to complete the dissolution process which will cover four to nine times the drainage area of ordinary acids. In retreatment work, the emulsion temporarily plugs permeable areas and deflects additional acid into strata which have not been treated. Halliburton service techniques allow successful treatment even in open hole areas where packers can not be set, in perforated zones with unwanted connecting channels and in extremely open zones.

Only a small volume of Acidfrac is required for retreatment work and, since no thick products are formed, a well may be produced in three to four hours after service. For initial treatment or retreatment in wells with limestone or dolomitic formations, you'll find Delayed Action Acidfrac is the economical, effective service. Learn how Halliburton Fracturing—with the unmatched experience of 50,000 jobs—can help boost your production records. Call your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON

FRACTURING SERVICES

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

Rio-Prado Consolidated Oils farmout . . . On this farmout agreement Rio-Prado will drill four blocks in the same general area and under similar arrangements. Continuous drilling will begin with this program as soon as a rig can be moved on after the road bans are lifted.

BRITISH COLUMBIA

Oil Shows Found at Fort St. John Well

Pacific Petroleum, Ltd.'s wildcat in the Fort St. John area of northeastern B.C. has encountered some oil in the Triassic zone. Te well is on LSD 2, 27-82-16w6, about 18 miles southeast of Fort St. John town. Recovery on drill-stem test at 4,340-55 ft. was 110 ft. of oil-cut mud and 90 ft. clean oil. Crew is drilling ahead at 4,812 ft.

More Mississippian Gas Pay Cored at Blueberry River

Canada Southern Petroleum, Ltd., has opened up about 133 ft. of indicated Mississippian gas zone at its Blueberry River area discovery near Mile Post 120 on the Alaska Highway.

A drill-stem test of a 22-ft. zone flowed gas at the rate of 10,000 M.c.f. per day. Gas was also found in the Triassic zone. Operator will core through the Mississippian without testing. When total depth is reached production tests will be made. Another well is reportedly planned down-dip from the 1 Alaska Highway gas prospect. The well will search for production in the Mississippian and Permo-Pennsylvanian.

ROCKY MOUNTAIN

COLORADO

Logan County Discovery

A flow gage of 413 bbl. of oil per day was announced by Sanford Production Co., Don Rounds Drilling and Anderson-Prichard Oil Corp. at 1 Hiscock, C SW NE 32-12n-54w, Logan County discovery. A second well in the field has been completed by Gibralter Oil Co. at 1 Union Pacific-Ayres, C SE SE 29-12n-54w. Production from both wells is from "D" sand.

Sohio Completes Discovery East of Little Beaver

Sohio Petroleum Co. has completed 1 Kejr "A," S½ NW SW 2-2s-56w, 2½ miles east of Little Beaver field, Washington County, for a pump gage of 33 bbl. of oil in 12 hours. Production is from "D" sand between 5,042-48 ft.

Delfern Recovers Oil at Logan County Wildcat

Delfern Oil Co. of Denver recovered 300 ft. of oil, 100 ft. of oil-cut mud and 300 ft. of water in 15-minute test of 1 Union Pacific-Peavy, C SE SE 19-12n-55w, wildcat in Logan County 1 mile east of South Long field. Test was of the zone 6,094-6,106 ft. The operator has run casing for completion.

UTAH

New East Central Utah Wildcats Started

Three new wildcats have been announced for the east central Utah area for an upswing in activity. El Paso Natural Gas Co. has skidded rig to 4-X Unit, C NW SE 33-12s-16e, Jacks Canyon area, Carbon County. In Emery County, H. B. Baldwin has spudded and is running surface casing at 1 Nelson, NW NE 9-20s-7e. Delhi-Taylor

These Bonds and Notes have not been and are not being offered to the public. This advertisement appears as a matter of record only.

Pacific Northwest Pipeline Corporation

$93,200,000 First Mortgage Pipeline Bonds, 4¼% Series due 1975

$26,800,000 3½% Unsecured Notes to Banks, due Serially from 1958 to 1962

Agreements relating to the purchase of the Bonds and to the making of the bank loans were negotiated for the Company by the undersigned.

White, Weld & Co.

Kidder, Peabody & Co. The Dominion Securities Corporation Union Securities Corporation

April 28, 1955.

This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these securities. The offering is made only by the Prospectus.

NEW ISSUE

Pacific Northwest Pipeline Corporation

$17,220,000 5½% Interim Notes, due June 1, 1957

Payable at maturity at Company's option by delivery of one share of Cumulative Preferred Stock, $3.30 Series, without par value, for each $60 principal amount of 5½% Interim Notes.

287,000 Shares Common Stock

(Par Value $1 per share)

Offered in units each consisting of one 5½% Interim Note ($60 principal amount) and one share of Common Stock, which will not be separately transferable until August 31, 1955.

Price $72 Per Unit

Plus accrued interest on the Notes from March 1, 1955

Copies of the Prospectus may be obtained in any State in which this announcement is circulated from only such of the underwriters, including the undersigned, as may legally offer these securities in compliance with the securities laws of such State.

White, Weld & Co.

Kidder, Peabody & Co. The Dominion Securities Corporation Union Securities Corporation

April 28, 1955.

Oil is rigging up rotary at the Seven Mile area, Grand County, wildcat 3 Government, NW NE SE 11-25s-20e. The latter is one of a series of so-called potash tests.

Shell Testing at Desert Creek Confirmation

Shell Oil Co. is continuing tests at 26-36 Desert Creek, SE NW SW 36-41s-23e, confirmation of the firm's Paradox discovery completed earlier this year. From perforated zones 5,444-5,538 ft. the well is pumping at the rate of 200 bbl. of fluid per day with a water cut of 20 per cent. The firm is starting a third well in the field, which is the first commercial area of southeastern Utah.

WYOMING

Northern Denver-Julesburg Activity Increases

A confirmation to Torrington field is being completed and casing has been run at an apparent new discovery on the northern side of the Denver-Julesburg basin. The indicated discovery is the True & Brown 1-X Smith, C NE SW 28-24n-61w, where casing is being run. Cores between 6,711-19 ft. showed sand with good stain, odor and fluores-

The Chicago Corp. and Republic Natural Gas Co. are preparing to Sandfrac 1 Van Mark, confirmation to the Torrington "J" sand discovery in Goshen County. Activity is high in this northernmost Denver-Julesburg basin area. Gem Oil Co. is drilling a wildcat on the edge of the basin at 2 Federal.

cence. At the Chicago Corp.-Republic Natural Gas Co. 1 Van Mark, C NE NW 4-23n-61w, a confirmation at Torrington, the operators swabbed 21 bbl. of oil in 21 hours from the zone 6,959-84 ft. The well was acidized prior to the swab test.

This area of the Denver-Julesburg basin became active following the Torrington field discovery earlier this year. Closest production is 40 miles south-

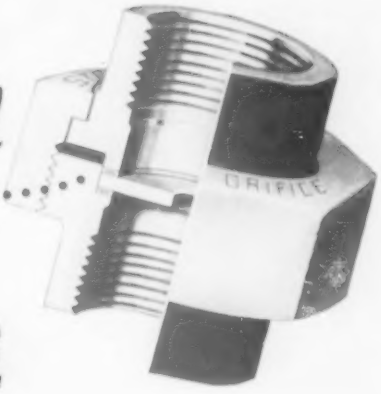
FOR THE BEST IN

Flow Control

INSIST UPON

C.M.& CO.

ORIFICE



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east in Banner County, Nebraska. Several new wildcats have been started as a result of the discovery.

Atlantic Refining Completing New Pay at Riverton

A new pay completion and field extension at Riverton, Fremont County, is being completed by Atlantic Refining Co. at 1 O'Conner, C NE SE 1-2s-4w (WRM). The well is 1¾ miles south of production in the field proper. The operator tested gas at approximately 2,000,000 cu. ft. daily with 21 bbl. of distillate from Frontier formation between 7,938-67 and 7,977-98 ft.

Texas Makes Large Gas Well at Alkali Butte

The Texas Co. has recompleted 5 Alkali Butte, C NW SE 1-33n-95w, Fremont County, with the well the largest gas producer in the field. The well had a flow of 19,000,000 cu. ft. of gas daily from Dakota-Lakota in zones between 4,084-4,147 ft. The well was originally completed in Lakota as a small gas and oil producer.

READ WHAT THIS DRILLER THINKS OF

May 6, 1954

Spang & Co.
P. O. Box 571
Butler, Pa.

Attention: Sales Manager

Gentlemen:

Last summer we purchased a set of your 8" Molloy Bits.

We have used these bits on a number of wells in the San Andres lime which is a very hard formation and a good formation to test the quality of steel in bits. Our experience with the Molloy Bits has been quite satisfactory and so far we have not jumped a pin off of these bits. With other bits we ordinarily jump one or more pins on each well we drill.

These bits stand up for a longer period of time and consequently do not have to be dressed as often. They have presented no problems in dressing or tempering. We use natural gas or butane in our forges.

We are well pleased with the bits and it is our plan to replace our other bits as they wear out with the Molloy Bits.

Yours very truly,
Name on request

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For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

NORTH DAKOTA

Northeast Landa Extension Finds Oil

Calvert Drilling Co. recovered 800 ft. of clean oil on drill-stem test at 1 Anderson, NW NW 6-163n-78w, extension at Northeast Landa, Bottineau County. The operator has cemented casing prior to further tests. The test was of the zone 3,071-84 ft. Recent drilling in Bottineau County has established the only producing area on the east side of the Williston basin in North Dakota.

NORTHERN NEW MEXICO

Raton Basin Tests Dry and Abandoned

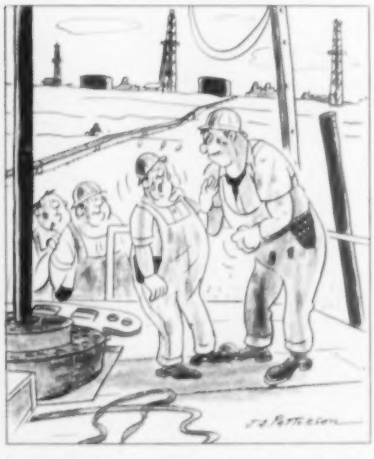
Abandonment has been ordered by Continental Oil Co. for 1 Springer, the last of the firm's series of tests in the Raton basin area of New Mexico. The wildcat is in 11-28n-21e, Colfax County.

No further plans are in evidence for further wildcatting by Continental in this area. It is reported that the company will drill tests between Tercio and Trinidad in southern Colorado this summer.

MONTANA

Atlantic Stakes Central Montana Wildcat

Location has been made for a new deep test in Yellowstone County 24 miles south of Northwest Sumatra field. Atlantic Refining Co. will drill the 1 Horton estate, C SE SW 18-7n-32e, Wolf Springs area, to Mission Canyon at around 7,500 ft. The Northwest Sumatra area has been the most active



"I wouldn't advise coming too close—I think I'm coming down with a cold."

in the state during the past year, with a recent new pay and important extension test completed in the Heath formation.

New Cedar Creek Anticline Wildcat Announced

Shell Oil Co. has made location at 22-X-36 State, SE SE NW 36-8n-59e, a wildcat in the Pennel area, Fallon County, another of the series along the Cedar Creek anticline. The well is midway between the firm's production at Cabin Creek and Little Beaver and will be a 9,350 ft. Red River test.

MISSISSIPPI

Pistol Ridge Completes Lower Cretaceous Well

Southern Production Co.'s Lower Cretaceous discovery well in the Maxie-Pistol Ridge area, of Forrest and Pearl River counties, turned out much better on potential gage than had been indicated in previous tests.

The well, 1 Pigford et al, in 3-1s-14w, on the northwest side of the Pistol Ridge sector, in Pearl River County, flowed 222 bbl. of 42°-gravity oil during its 24-hour completion gage. Flow was through 5/32-in. choke with tubing pressure of 1,150 psi. and gas-oil ratio of 600 cu. ft. per barrel.

The Lower Cretaceous pay is perforated at 9,080-90 ft., about 250 ft. below the top of the section.

Pistol Ridge becomes the tenth Mississippi field in which Lower Cretaceous production has been obtained. Other production in the Maxie-Pistol Ridge area is from the Upper Cretaceous Eutaw and Tuscaloosa sands.

Crow Drilling Co. and Larco Drilling Co. are joint operators with Southern Production Co. in the new discovery.

OHIO

National Gas & Oil has completed on 1 Lucinda Brinker in Lot 38, Clark Township, Coshocton County, what is probably the best initial producer in Layland pool. First Clinton at 3,482-3,500 ft. was fractured and flowed 515 bbl. in 24 hours.

- Mutual Oil & Gas 1 (4) Druzella Rice, Section 1, Jefferson Township, Knox County, an outside location on the west side of Greer pool, made 318 bbl. and 500,000 cu. ft. gas in a 6-hour test after treatment. Clinton sand was reported at 2,747-2,808 ft. with 12 bbl. natural.
- H. D. Collins 12 Lemon, in the

ALTEN PUMPING UNITS

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They are The Trend of TOMORROW

Last year Alten sales surged to an all time high because Alten has consistently offered more—and now—for 1955—Alten has designed and produced a line of pumping units with so many incredible improvements that it is years ahead of the field . . . SEE AND BE AMAZED . . . you'll realize that this is indeed something big. You'll see an ultra-new kind of a unit that will drive pumping costs down year after trouble-free year. Here is tomorrow's pumping unit today!

Write for this booklet

Get all the facts on new Alten units—send a postcard for this descriptive booklet—your copy is waiting.

AT YOUR LOCAL SUPPLY STORE

ALTEN
FOUNDRY & MACHINE WORKS INC.
LANCASTER, OHIO

old Maysville pool of Green Township, Hocking County, found the Clinton at 3,083-3,108 ft. with 2 bbl. natural and 180 bbl. in a 24-hour test 4 days after fracturing.

Successful Wildcats

SOUTHWEST TEXAS

Hidalgo County: Westag Corp. and Clark Fuel Oil Co. 1 Westag, Porcion 42. IP 2,500 M.c.f. daily, open-flow potential, dry gas, perforations 2,786-2,802 ft. TD 5,500 ft. (New field.)

Val Verde County: Phillips Petroleum Co. 1-A Cauthorn, C&M Sur. 49, Block A. IP 42,000 M.c.f. daily, open-flow potential, GCR 1,000 M.c.f. per barrel, 58°, Pennsylvanian-Strawn lime 9,982-10,052 ft. and 10,194-262 ft. (perforations). TD TD 10,303 ft. (New field in Vinegarrone area.)

Wilson County: Texita Oil Co. et al 4 Taylor, John W. Brown Sur., A-54. IPP 21.21 BOPD (net), 50 per cent water, 20°, Bartosh (Wilcox) sand 1,600-07 ft. (peforations). TD 1,608 ft. (New pay in East Floresville field.)

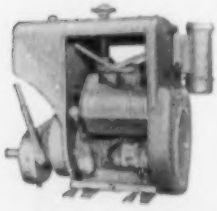
TEXAS GULF COAST

Harris County: Houston Oil Co. of Texas 2 Swilley et al, Victor Blanco Sur., A-2. IP 2,000 M.c.f. daily, open-flow potential, GCR 49 M.c.f. per barrel, 47°, perforations 8,795-8,802 ft. TD 9,113 ft. (New pay in Victor Blanco field.)

WISCONSIN-POWERED

Variable Controlled Pumping Unit

This highly-mobile trailer-mounted pumping unit is powered by a VG4D Power Unit with a heavy-duty transmission having several speed ratios, reverse and neutral. The engine couples directly to a 2" rotary pump with a capacity of 14 BPH @ 1,000 lbs. and 70 BPH @ 400 lbs. While the picture above shows the unit testing a pipe line in Southern Oklahoma, it's also widely used to pump crude oil of various viscosities into pipe lines having a wide range of pressures. Does the unit deliver dependability? See what the operator says about its record.



Model VG4D Power Unit (25 to 36 hp.) with Clutch Reduction.

"The performance is trouble-free," he states. He also adds that this lightweight unit, "really gets the job done — no matter what the assignment." . . . a typical opinion from a satisfied user.

Wisconsin Heavy-Duty Air-Cooled Engines are available in a complete power range from 3 to 36 hp., in 4-cycle single cylinder, 2- and V-type 4-cylinder models. These engines can be equipped to operate on kerosene, butane, propane or casinghead gas, utilizing the most readily available and economical fuels.

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Jackson County: Southern Minerals Corp. 1 McDowell, Hugh McGuffin Sur., A-43 1 mile northeast of Point Comfort). IP 74,000 M.c.f. daily, open-flow potential, GCR 34.8 M.c.f. per barrel, 53°, perforations 7,442-46 ft. TD 8,793 ft. (New field.)

Montgomery County: Sinclair Oil & Gas Co. A. & M. College of Texas, A. W. Springer Sur., A-490. IP 240,000 M.c.f. daily, open-flow potential, GCR 82 M.c.f. per barrel, 59.5°, SIP 2,054 psi., Cockfield 5,454-60 ft. (perforations). TD 5,795 ft. New field—Springer.)

EAST TEXAS

Harrison County: Sam Sklar 1 Atkins, Bailey Anderson Sur., A-2, 15 mi. S Marshall, IP 5,200 M.c.f., plus 51 bbl. 66.4° distillate per 1,000 M.c.f., GLR 22,500:1, perforated Crane zone of Pettit 6,487½-91½ ft. TD 6,532 ft.

WEST CENTRAL TEXAS

Callahan County: Humble Oil & Refining Co. 1 Betcher, 8-6-SPRR, 7 mi. NW Oplin. IP 46.83 BOPD, ¼-in., 41°, TP 245 psi., GOR 110, Cook sand 1,780-86 ft. TD 4,881 ft.

Jones County: Creslenn Oil Co. 1 Threadgill, Subd. 5, J. W. McKissick Sur. 208, 6 mi. SW Anson. IP 100 BOPD, 16/24-in., no water, TP 125 psi., GOR 298, 41°, middle Strawn 4,585-90, 4,592-96 ft.; IP 100 BOPD, 16/64-in., no water, 42°, lower Strawn 4,649-55, 4,659-67 ft. TD 4,723 ft.

Throckmorton County: Warren Petroleum Corp. 8 Batchler, Sec. 2104, TE&L Sur., 11 mi. E Throckmorton. IPP 73 BOPD, 37°, GOR 268, Strawn sand 2,845-50 ft. TD 4,827 ft.

NORTH TEXAS

Grayson County: Snuggs & Cox 2 Davis, W. G. Miller Sur., A-780, 3 mi. SE Collinsville. IPP 32 BOPD, 28°, GOR 500, pay 3,981 ft. TD 3,990 ft.

Standard Oil Co. of Texas 1 Wright, J. H. Winton Sur., A-1384, 5½ mi. NW Sherman. IP 256 BOPD, 13/64-in., TP 1100 psi., GOR 1190, top pay 9,207 ft. TD 9,675 ft. Ground elev. 728 ft.

Jack County: Lone Star Producing Co. 1-E Cherryhomes, J. D. Sutton Sur., A-1187, 10 mi. E Jacksboro. IP 377,000 cu. ft. gas, TP 520 psi., 14/64-in. choke, perforated 5,497-5,510 ft. TD 5,624 ft. Elev. 881 ft.

Warren Petroleum Corp. 1 Crowley, W. Brescoe Sur., A-115, 5½ mi. NE Jacksboro. IP 42 BOPD, 28/64-in., TP 1,820-27 psi., GOR 14,980, conglomerate pay 5,309-14 ft. TD 5,697 ft. Recompletion, formerly dry at 3,608 ft.

Wilbarger County: Burt Drilling Co. 1 Middleton, 15-9-H&TC, 2½ mi. W Lockett, IPP 92 BOPD, 38°, upper Canyon sand 3,708 ft. TD 3,714 ft. Elev. 1,303 ft.

L. L. Lomack 1 Blackman, W. A. McKinney Sur., A-178. IPP 62 BOPD, 39°, GOR 540, Mississippian 4,516 ft. TD 4,552 ft.

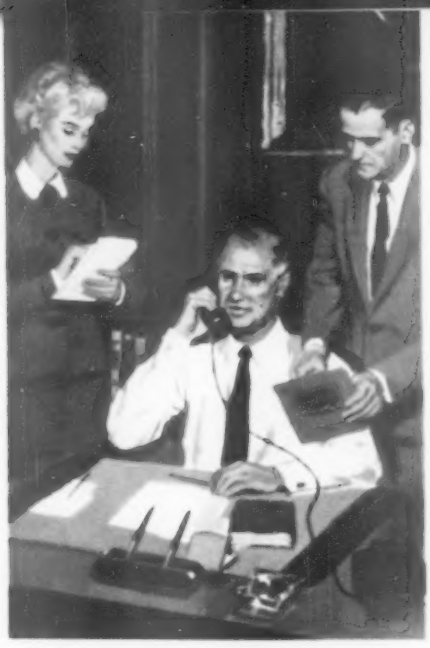
Young County: Earl Jackson 1 Davidson, TE&L Sur. 1184, 8 miles SW Murray, IPP 91 BOPD, 42°, GOR 540, Mississippian 4,516 ft. TD 4,552 ft.

WEST TEXAS

Andrews County: Midwest Oil Corp. 1 Cothes, 5-A34-PSL, 15 mi. NW Andrews, IPP 180 BOPD, 33.7°, GOR 197, Glorieta 5,914 ft. TD 6,805 ft., ground elev. 3,241 ft.

Borden County: Magnolia Petroleum Co. 1 York, 279-97-H&TC, 13 mi. E Gail. IPP 102.4 BOPD, 23.9°, GOR 295, pay 5,695 ft., elev. 2,452 ft. TD 8,310 ft.

Scurry County: D. E. Vasser and A. H. Howard 1 Voss, 188-97-H&TC, 3 mi. SW



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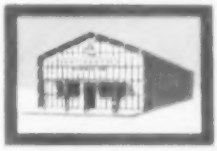
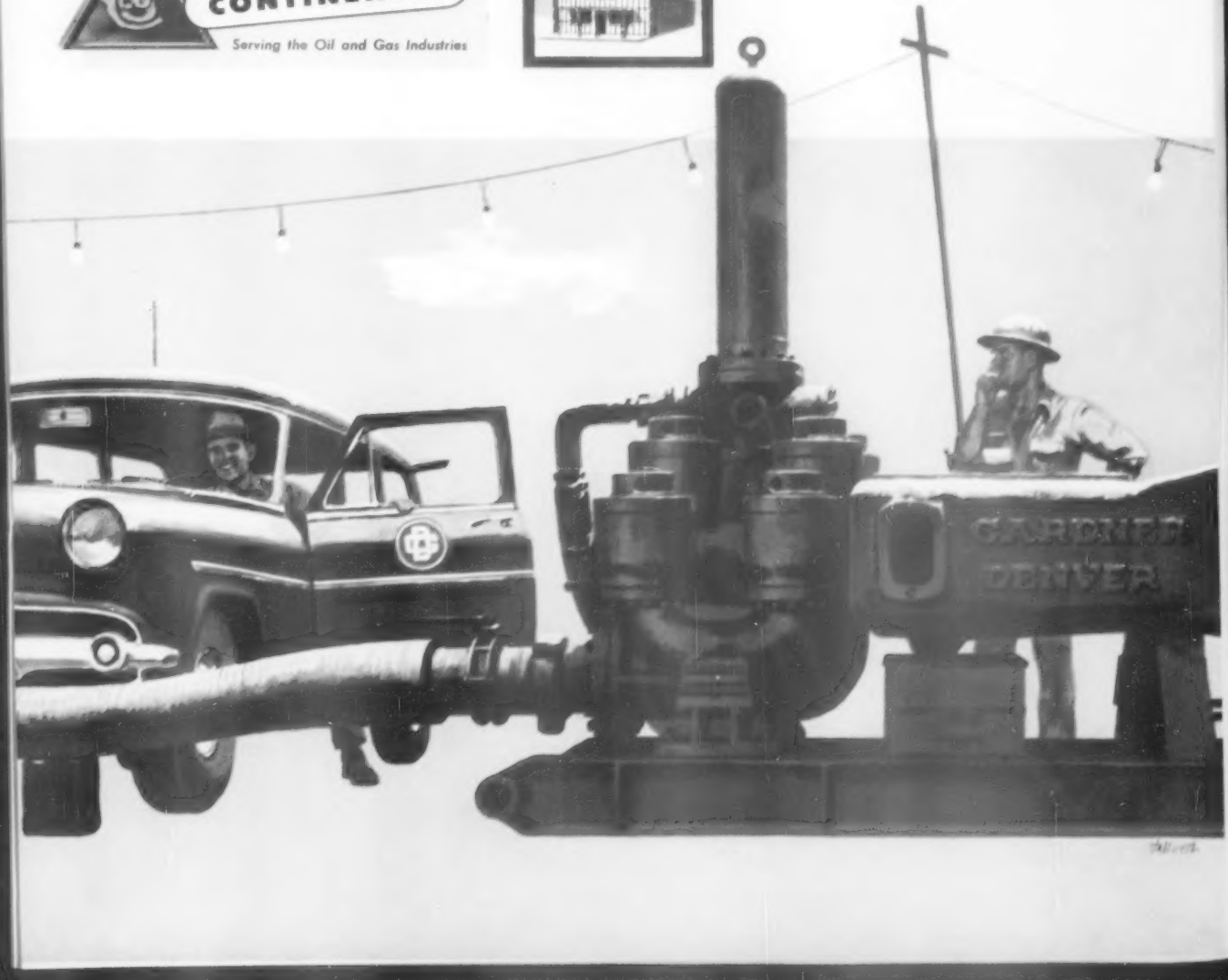
Serving the Oil and Gas Industries





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The experience and training of your Continental representative qualifies him to help you select the correct Yellow Strand for any oil field application. He knows why Yellow Strand gives more ton-miles of service... why Yellow Strand is more flexible and easier to handle.

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THE CONTINENTAL SUPPLY COMPANY
General Offices: DALLAS, TEXAS
Representatives in All Principal Oil Fields of the World

CONTINENTAL
Serving the Oil and Gas Industries

Snyder. IPP 102 BOPD, 40°, GOR 316, ground elev. 2,371 ft., pay 6,877 ft. TD 6,920 ft.

Ward County: Cities Production Corp. 1-B Brandenberg, 4-32-H&TC, 2 mi. SW Grandfalls. Devonian extension and Ellenburger discovery, dual completion. Ellenburger IP, open flow, 12,500 M.c.f., plus 50.7 bbl. distillate per 1,000 M.c.f., open hole 10,086-10,215 ft.; Devonian IP 62,000 M.c.f., plus 45.9 bbl. distillate per 1,000 M.c.f., perforations 6,662-6,870 ft. Elev. 2,434 ft. TD 10,215 ft.

MICHIGAN

Isabella County: John Neyer, Raymond Miller and Byron Gallagher 3 Powell, SE SE NE 30-16n-5w. IPF 21 BOPD, Dundee 3,802 ft., pay 3,805-06 ft. TD 3,806 ft. (New pool.)

SOUTH LOUISIANA

Beauregard Parish: Justiss-Mears Oil Co. and Winston L. Stokes et al 1 Husser-Davis, 24-6s-11w. Shut-in gas-condensate well, no gage, tubing pressure 2,500 psi. through ⅛-in., perforations 8,452-55 ft. TD 9,010 ft. (New field.)

LEGAL

SEALED BIDS will be received until May 19, 2:00 P. M. Central Standard Time, and opened at that time in the Office of the Superintendent, Fort Berthold Indian Agency, New Town, North Dakota, for the leasing of 8,908.60 acres of allotted Indian land, located in township 149 N. R. 94 W., township 150 N. R. 94 W., township 150 N. R. 95 W., McKenzie County, North Dakota for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Fort Berthold Indian Agency, at New Town, North Dakota, or call the Agency Land Office, Phone 74340, New Town.

Calcasieu Parish: W. T. Burton 3 Lawton et al, 27-10s-11w. IP 51 BCPD and 2,243 M.c.f. daily, ⅜-in., 41.8°, perforations 11,251-55 ft. TD 11,501 ft. (New pay in Pine Ridge field.)

Cameron Parish: Superior Oil Co. 2 Rockefeller-State Lease 2039, 23-16s-3w. IP 145 BCPD and 8,555 M.c.f. daily, 7/32-in., 45.5°, perforations 14,582-608 ft. TD 14,995 ft. (New pay in Constance Bayou field.)

Lafourche Parish: British-American Oil Producing Co. 1 Savoie et al, 56-17s-20e. IP 197 BOPD, 7/64-in., 34.7°, GOR 1 M.c.f. per barrel, perforations 9,840-48 ft. TD 10,400 ft. (New pay on southeast flank Valentine dome).

NORTH LOUISIANA

Claiborne Parish: New pay in Antioch field. T. L. James & Co., Inc. 1 Scaife, NW NW 28-22n-5w. IPF 251 BOPD, 12/64-in. choke, Haynesville 10,336-344 and 10,298-314 ft. GOR 2,500:1, 48.4°. TD 10,753 ft.

Franklin Parish: Extension to Lamar field. Hudson Gas & Oil Co. J. T. O'Brien, 1¼ miles west of production, 4-15n-9e. IPF 154 BOPD, 8/64-in. choke, 41.4°, GOR 487:1, Tuscaloosa 5,067-70 ft. TD 5,150 ft.

ARKANSAS

Nevada County: Discovery of Irma field, Cotton Valley pay. Jones-O'Brien, Inc. 3 Tommy Jackson, 31-13s-20w. IPP 69 BOPD, Cotton Valley 3,680-84 ft. 36° TD 4,014 ft.

OKLAHOMA

Beckham County: Randall Oil Co. 1 Trissell, NW SE SE 31-8n-21w. IPP 30 BOPD, dolomite and granite 894-1,035 ft., 38.8°, TD, 1,035 ft. (Oil discovery.)

KANSAS

Barber County: Adair 1 Bloom, NE NE NW 23-32s-12w. IPP 67 BOPD, Simpson 4,674-75 ft., 35°. TD 4,675 ft. (Opens Bloom pool).

Magnolia Petroleum Co. 1 Traffas, NW NW SE 6-33s-10w. IP 1,462 M.c.f. of gas per day, Mississippian 4,590-4,604 ft. TD 5,152 ft. (Gas discovery).

Kingman County: Pickrell Drilling Co. 1 Keimig, SW SW NE 34-30s-9w. 1¾ miles from nearest production. IP 1,500 M.c.f. of gas per day. Miss. 4,367-77 ft. TD 4,430 ft. (Gas discovery).

COLORADO

Jefferson County, Soda Lakes: S. D. Johnson 1 Lillie Pallaoro, SW NE NW 7-5s-69w. IPF 100 BOPD, Codell discovery, new field. TD 9,655 ft.

Logan County, North Casement: Anderson-Pritchard Sanford & Rounds 1 Hiscock, C SW NE 32-12n-54w. IPF 413 BOPD, "D" sand discovery, new field. TD 5,665 ft. "J" sand.

Washington County, Kejr field: Sohio Petroleum et al 1 Kejr "A," S½ NW SW 2-2s-56w. IPP 33 BO 12 hours, "D" sand discovery, new field. TD 5,205 ft. "J" sand.

SASKATCHEWAN

Canso Oil Producers 7-19 Hilldale, LSD 7, 19-32-27w3. Viking gas well. TD 2,860 ft.

Central Del Rio-Hudson's Bay 10-8 Ralph, LSD 10, 8-7-13w2. Indicated Mission Canyon oil well. TD 4,580 ft.

BRITISH COLUMBIA

Texaco-NFA 6 Nig Creek, 57 degrees 5 minutes 39 seconds north Latitude, 121 degrees 38 minutes 42 seconds west Longitude. TD 4,970 ft. Triassic gas well.

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FASTER CORING TIME
FEWER TRIPS
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Whether in slim-hole or conventional drilling, D & S Diamond Equipment for wire line coring will merit consideration.
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"Oh, don't get excited. All I wanted you to do is clean my windshield glass."

Dickey Determined

Texas Pacific executive set sights, went to top

ROBERT I. DICKEY, recently named vice president of Texas Pacific Coal & Oil Co., made a decision 21 years ago while working on a master's degree in geology at Washington University in St. Louis that led him to an executive position in the oil industry.

The year 1934 didn't offer a young man of 26 much in the way of a job—not even a fellow with a sheepskin testifying to his geological knowledge. Dickey played it smart and looked around before going into the industry.

He believed—in fact was certain—that oil would fuel the world during his lifetime, so with this knowledge he headed for Texas. A New Englander originally, Dickey had received his first college training at Clark University in his home town of Worcester and then had taken postgraduate work at Johns Hopkins University in Baltimore before going to Washington U. in St. Louis.

His first job in the petroleum field was with Stanolind Oil & Gas Co. in the gravity department at Houston. He was later transferred by Stanolind to Midland, Tex., where he resided from 1937 until early this year.

Dickey left Stanolind for Forest Oil Corp. in 1939. Starting with the Pennsylvania concern as district geologist, he worked up to manager of the exploration department and to vice president in charge of West Texas and New Mexico in 1952.

Big success . . . From then until Dickey's resignation early in 1955, Forest had notable success in these areas. The most spectacular was its collaboration with Cities Service Oil Co. in bringing in the Ellenburger strikes at the Dora Roberts ranch near Midland. The first strike, the 1 Dora Roberts C-4, flowed in with an initial production of 3,200 bbl. daily. Since then the firms have added more successful wells on the ranch.

Texas Pacific wasted no time in reaching Dickey after his resignation. He was named to an executive position April 1 and was elected vice president in charge of exploration about 3 weeks later.

Dickey is married and has two children, Robert Mark, 7, and Caroline, 10. Mrs. Dickey, Josephine, is a native of Breckenridge, Tex. His hobby, when time permits, is golf.

He is a member of the American Association of Petroleum Geologists, Geological Society of America, American Petroleum Institute, and Independent Petroleum Association of America. He also has served as past president of the West Texas Geologists Society. While at Midland, he served on the Midland city council, was a director of the city's chamber of commerce, and was West Texas chairman of the Oil Industry Information Committee.

Norman C. Penfold, chairman of Southwest Institute's department of engines, fuels, and lubricants research, has been named vice president of the institute.

L. P. Maier has retired as chairman of the board and a director of International Petroleum Co., Ltd., affiliate of Standard Oil Co. (N. J.). **John J. Waybright** has been elected chairman of the board to succeed Maier.

Lawrence A. Warzel, former research engineer with Ethyl Corp. at Detroit, has joined Phillips Petroleum Co. as a chemical engineer at Bartlesville, Okla. Warzel recently received his Ph.D. degree from the University of Michigan.

B. L. Loupee, Service Oil Co., Cassopolis, Mich., was elected president of the Michigan Petroleum Association at its recent twenty-first annual spring convention in Detroit. Loupee succeeds **A. L. Truesdell,** J. Austin Oil Co., Wayne, Mich. Other officers chosen are **Frank Fehsenfeld,** Crystal Flash Petroleum Corp., Grand Rapids, vice president; **V. H. Kellerman,** Star Oil Co., Port Huron, secretary; **Ferris Rennie,** Rennie Oil Co., Traverse City, treasurer; and **Joseph Hadley,** Detroit, executive secretary and general counsel.

Richard C. Shelton, district geologist with Ohio Oil Co. at Olympia, Wash., has been transferred to Salt Lake City as district geologist.

John E. Overbeck has been named vice president for engineering and research of Columbia Gas System Service Corp. He succeeds Charles F. de Mey, deceased.

C. R. Mote, former drilling foreman for American Republics Corp. at Midland, Tex., has resigned to accept a position as field superintendent with G. W. Strake Oil Co. at Winters, Tex.

P. J. BYRNE, JR.

P. J. Byrne, Jr., has been appointed deputy to **Charles E. Paules,** vice president of Esso Research & Engineering Co. Byrne had been serving as manager of the Esso Engineering organization with headquarters at Bayway refinery in Linden, N. J. In his new job, Byrne will be responsible for coordinating the firm's international refinery engineering activities. **John W. Packie,** chief design engineer for Esso Research since 1951, has been promoted to general manager to succeed Byrne. **Luther B. Martin,** assistant chief engineer of the company, has been named associate manager.

JOHN W. PACKIE

L. B. MARTIN

L. F. Hills, former acting assistant to the chief engineer of Arabian American Oil Co., Dhahran, has been transferred to Aramco Overseas Co., The Hague, where he has been named assistant chief engineer. **J. P. Lunde,** former acting liaison coordinator of engineering, has succeeded Hills. **J. W. Barker,** former acting engineering coordinator, succeeded Lunde, and **R. E. Clausen,** manager of the engineering department of the general office, has been named engineering coordinator. **F. S. Ellers,** assistant chief engineer of Aramco Overseas, replaces Clausen.

PERSONALS

Olin Culberson, member of the Texas Railroad Commission, has been appointed to the regulatory practices committee of the Interstate Oil Compact Commission.

Vernon Taylor has been appointed manager of the western division of the producing department of Imperial Oil, Ltd., with headquarters at Calgary. He succeeds **W. D. C. MacKenzie,** who was elected a director of the company. Taylor, former management assistant in the division, will be in charge of Imperial's exploration and production operations in Canada's four western provinces and the Northwest Territories. He joined Imperial in 1937 as a petroleum engineer.

George F. Brown, of Sun Oil Co. at Amarillo, Tex., was elected the first president of the recently founded American Association of Petroleum Landmen at the group's first meeting in Fort Worth on April 30. Other officers are **Miller Waggoner,** Harper Oil Co., Oklahoma City, first vice president; **Tillson D. Craft,** Continental Oil Co., San Antonio, second vice president; **Robert E. Barnard,** Carter Oil Co., Denver, third vice president; and **Owen F. Stevens,** Rogers Oil Co., Scottsbluff, Neb., treasurer.

Albert E. Pierce, vice president of production for Mid-Continent Petroleum Corp., has retired. He had been with the firm since 1920, when he was a district production superintendent for the old Cosden Oil Co., which Mid-Continent bought.

C. Gibson, district geophysicist for Socony-Vacuum Oil Co. of Canada, Ltd., at Regina since early 1953, has been transferred to the company's Calgary offices as staff geophysicist.

JOHN TALBOT

John Talbot has been promoted to compressor superintendent by Tennessee Gas Transmission Co. Talbot, former assistant compressor superintendent, has more than 30 years of experience in the oil and gas industry. He joined T.G.T. in 1943 as superintendent of the Monroe, La., station and was promoted to division superintendent in 1945. **George White,** former engineer in the compressor section of the company's operating department, has been advanced to assistant compressor superintendent.

Illinois Oil Men Elect Officers

Officers for the Illinois Oil and Gas Association, pictured above, are, sitting, left to right, Homer Rutherford, Mount Vernon, third vice president; O. E. Beaty, Mount Vernon, secretary; David R. Stewart, Mattoon, president; Thomas N. Duncan, Fairfield, second vice president; and standing, left to right, C. R. Collins, Mount Vernon, treasurer; C. T. Smith, Flora, general counsel; and Charles J. Pardee, Mount Vernon, executive secretary. E. J. Reading, Evansville, Ind., first vice president, is not pictured.

M. C. Brunner, production manager for Shell Oil Co.'s Midland, Tex., area, has been named to a senior administrative and engineering position abroad.

M. C. BRUNNER

VAN DUZEE

E. N. Van Duzee, production manager of Shell's New Orleans area, has been named to succeed Brunner. Brunner joined Shell in 1926 and held various administrative and field positions before entering service in World War II. After his discharge, he was assigned to Houston as special assistant to the vice president. In 1948, he was named area production manager. Van Duzee also joined Shell in 1926. He was promoted to production manager at New Orleans in 1948. **J. W. Pittman,** presently in New York, will succeed Van Duzee at New Orleans.

A. D. Jett has been promoted to assistant division purchasing agent of the Texas producing division of Pure Oil Co. at Fort Worth. Before his promotion, Jett served 25 years in the purchases, material, and production departments in Fort Worth and Van, Tex.

D. L. Porter, assistant district superintendent for the company in West Texas, has been transferred to Van as assistant district superintendent for the Van joint account.

R. S. Wansbrough, former petroleum engineer with Stanolind Oil & Gas Co. at Houston, has resigned and joined Delhi-Taylor Oil Corp. as a petroleum engineer in the central engineering department at McAllen, Tex.

Kenneth C. Cribley has been named manager of the products pipelines and products terminals of Champlin Refining Co., of Enid, Okla. He was general superintendent of the firm's Stratton pipeline in South Texas.

J. Frank Drake has retired from the chairmanship of the executive committee of Gulf Oil Corp. Drake, who served 17 years as president of Gulf Oil and 5 years as chairman of the board, had held his last position 2 years. He joined Gulf in 1919 and served until 1923 when he became president of Standard Steel Car Co., another Mellon company. When Standard Steel was merged with the Pullman companies in 1930, Drake became chairman of the board. He returned to Gulf as president in April 1931,

PERSONALS

when the late W. L. Mellon, then president, was elected chairman of the board. When Mellon resigned this position in May 1948, Drake was named his successor.

Willard F. Bailey, Howard S. Bryant, Richard B. Rutledge, and **H. Lee Spyres** have been advanced from division geol-

W. F. BAILEY

H. S. BRYANT

ogists to division exploration managers by Skelly Oil Co. Bailey, who will manage the western division, has been with Skelly 19 years and has served in Texas and northern Louisiana. Bryant, named manager of the northern division, has been with Skelly 27 years and has worked mainly in Kansas, Colorado, North and South Dakota, and southwestern Texas. Rutledge, appointed manager of the central division, has been with Skelly 26 years, serving in Oklahoma, Kansas, and Texas. Spyres, promoted to head the southern division, joined Skelly in 1935 at Houston. He has served as district geologist in the Gulf Coast areas of Texas, Louisiana, and Mississippi. Other promotions announced by Skelly are **John R. Gis-**

R. B. RUTLEDGE

H. L. SPYRES

burne, district geologist at Albuquerque, N. M., promoted to division geologist of the western division; **Clifton J. Nolte,** district geologist at Denver, advanced to division geologist for northern division; **George R. Wesley,** staff geologist at Tulsa, named division geologist for the central division; **Judd H. Oualline,** district geologist at Houston, promoted to division geologist in charge of the Texas Gulf Coast area of the southern division; **Victor N. Fischer,** division geologist, remains in charge of the Shreveport and Jackson, Miss., offices of the southern division; **William M. Erdahl,** senior geophysical supervisor, promoted to chief geophysicist; **John I. Moore,** head of the reserves section, named supervisor of the newly created economics section of the geological department; and **W. D. Carson,** promoted to succeed Moore in the reserves section.

John C. Thrash, Jr., former district engineer with Forest Oil Corp. in West Texas and New Mexico, has resigned to join British-American Oil Producing Co. as staff engineer at Odessa, Tex.

Al H. Barton, district geologist at Lake Charles, La., for Union Sulphur & Oil Co. the past 8 years, has resigned to join the firm of L. C. Aycock & Associates at New Orleans.

James H. Curtis has been elected vice president of Lummus Co., New York. Curtis who was formerly general manager of manufacturing for General Petroleum Co., has been serving as assistant to the president of Lummus.

Hugh F. Crain, former district geologist of Phillips Petroleum Co. in southern Louisiana, has been promoted to assistant to the regional geologist at Bartlesville, Okla.

Howard M. Perdue, former field engineer with Union Oil & Gas Corp. of Louisiana, has been transferred to Houston as petroleum engineer.

W. A. McElhannon has been promoted to senior civil engineer (supervisory) in the design department of the engineering division of its Baytown, Tex., refinery by Humble Oil & Refining Co. **R. E. Kappler** has been promoted to mechanical engineer in the same department.

Monroe J. Rathbone, president of Standard Oil Co. (N.J.), has been given an achievement award by Lehigh University, his alma mater. Rathbone was cited for his contributions to the petroleum industry and for his service to civic, educational, and religious interests.

DEATHS

Frank F. Lockwood, 83, retired Tulsa oil man, died May 2 at his home in Ames, Iowa. He was active in the oil business in Tulsa from 1918 to 1950.

Dr. Gustav Egloff, 69, director of research for Universal Oil Products Co., Des Plaines, Ill., and one of petroleum's foremost good-will ambassadors, died in Chicago April 29 after a brief illness. His tremendous energy and willingness to undertake any task led a national magazine to accuse him whimsically of being quintuplets. Egloff was born in New York of Swiss parents. He attended Cornell University and was graduated with an A.B. in 1912. He took graduate work at Columbia University, where he was awarded an M.A. in 1913 and a Ph.D. in 1915. He began his career with Universal in 1917, when the company had only one small research building in Independence, Kans. Since then he contributed to the growth and modernization of the refining industry by authoring more than 650 articles on petroleum and patenting more than 300 processing ideas. He delivered papers at World Petroleum Congresses held in London, Paris, and The Hague and was scheduled to present a paper at the Fourth World Petroleum Congress in Rome next month. Egloff remained active until recently. His last public appearance was at Golden, Colo., on April 15.

Laurent B. Smith, 58, chief gager for Sinclair Pipe Line Co., died recently at his Bristow, Okla., home after suffering a heart attack.

Avis John Attebery, 49, division marketing assistant for Socony Mobil Oil Co., Inc., at Kansas City, died recently after being injured in an automobile wreck.

C. I. (Hi) O'Neill, founder of the Illinois Basin Oil Field Report, died recently in Effingham, Ill., after a short illness. He established the oil-field report in Effingham in June 1937.

John L. Sallee, 58, oil producer and drilling contractor in the Illinois-Indiana-Kentucky area, died recently after suffering a heart attack. He had worked in the tristate area for 16 years.

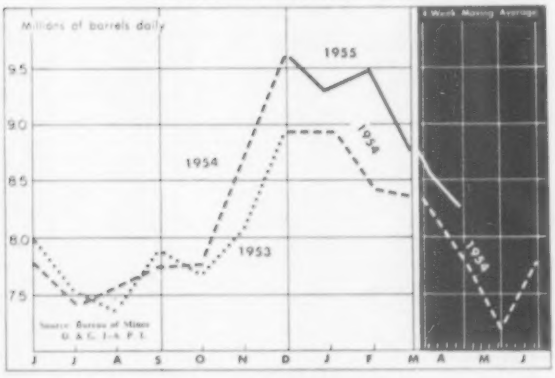
Dr. Irving Perrine, 71, Oklahoma City geologist and petroleum pioneer, died there recently. He was a faculty member at the University of Oklahoma from 1912 to 1915. At one time, Perrine headed six oil corporations.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,839,300	UP	2,250	UP	187,715
Crude stocks	272,781,000	UP	1,356,000	UP	3,134,000
Completions	1,085	UP	6	UP	73
Refinery runs	7,159,000	UP	60,000	UP	484,000
Gasoline stocks	176,759,000	DOWN	2,982,000	DOWN	299,000
Distillate stocks	67,635,000	UP	1,957,000	UP	6,230,000
Four-product stocks	309,293,000	DOWN	1,174,000	UP	7,003,000
Total imports	1,049,100	UP	21,800	UP	270,500

TOTAL DEMAND—ALL OILS



Summer-Fill Plans for Heating Oils Start Earlier This Year

ESSO STANDARD OIL CO. announced its summer-fill program for light heating oils, effective May 2. This program, covering a large portion of the East Coast area, went into effect about 15 days earlier than last year.

Adjustments in posted prices and voluntary allowances were made at the same time. Esso lowered its posted prices for light fuels for both wholesale and tank-wagon deliveries.

Posted prices for wholesale delivery of No. 2 distillate, kerosine, and diesel fuel were reduced by 0.15 cent per gallon. Postings for light marine diesel fuel were cut 6 cents a barrel and heavy marine diesel 8 cents a barrel.

In addition to changes in posted prices, Esso adjusted its previously announced voluntary allowance on light heating oils to 0.5 cent a gallon.

Prior to the announcement of the latest changes, posting for barge delivery of No. 2 fuel in New York Harbor was 9.95 cents a gallon, but some suppliers were offering material at a discount. Esso's first voluntary allowance of 0.3 cent a gallon brought the net barge price to 9.65 cents. The latest change in posting and allowance cuts the net price for No. 2 fuel to 9.3 cents. The current net price for barge delivery of kerosine in New York Harbor is 10.05 cents a gallon.

Corresponding net prices last year after announcement of summer-fill programs were 8.95 cents for No. 2 fuel and 9.95 cents for kerosine. Formal quotations remained at this level during the summer but some suppliers offered No. 2 fuel and kerosine at 8.70 and 9.70 cents respectively by midsummer. The normal spread between kerosine and No. 2 fuel of 1 cent a gallon dropped to 0.75 cent before the start of the heating season last year.

The price-protection provisions of Esso's summer-fill program are similar to those in effect last summer. Consumers who buy at tank-wagon prices will be charged at the lowest price in effect between May 2 and September 1. For customers with established credit ratings, payment will be deferred until October 1.

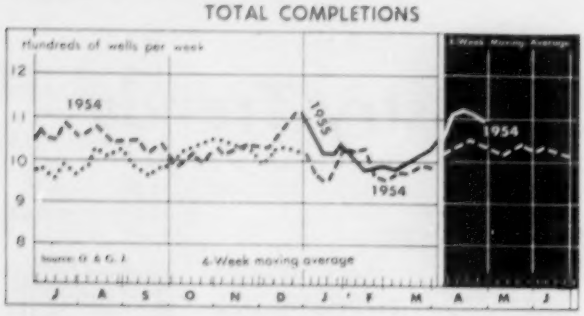
Jobbers and other resellers will be protected only against price decreases during the summer. If a jobber waits until August to fill his tanks, he accepts the risk of a price increase between now and the time he buys the oil. If he fills his tanks early in the summer, he is protected against any reduction in posting during the summer. Payment for summer-fill purchases will not be due until October.

Tank-wagon prices for No. 2 and kerosine were cut 0.2 cent a gallon in most of Esso's marketing area on the East Coast plus a voluntary allowance of 0.5 cent.

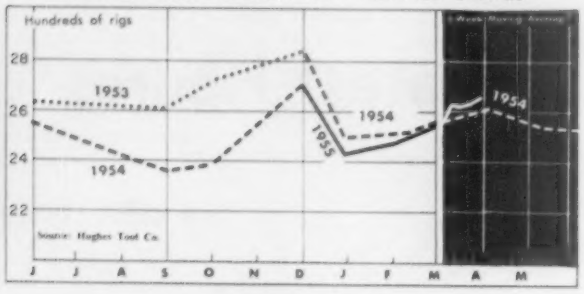
Inland gasoline markets are firmer . . . Continental Oil Co. announced an increase in the tank-wagon price of gasoline in the Rocky Mountain area amounting to 0.4 cent a gallon. Some marketers are predicting a general increase in tank-wagon gasoline prices in the North Central states.

Group 3 spot prices have moved up 0.5 cent in the last month and formal quotations have gained 0.25 cent. Spot quotations are still 0.25 under postings, but may move up with an increase in tank-wagon prices.

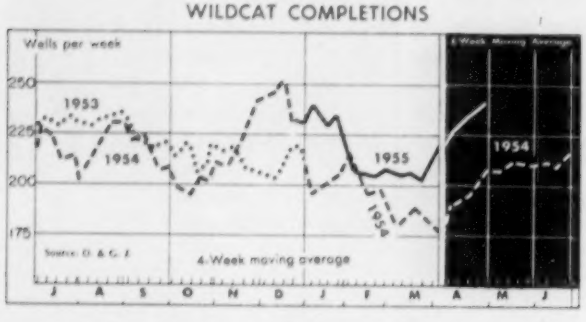
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	5-2-55	Change from 4-25-55	Change from 5-3-54
Gulf Coast	563	—18	—3
N. and W. Texas-New Mexico	878	17	73
Arkansas-N. Louisiana-E. Texas	160	—2	—31
Oklahoma	357	37	1
Kansas-S. Nebraska	194	3	31
Illinois-Eastern	143	—9	17
Rocky Mountain	209	7	— 45
Pacific Coast	152	—5	12
Total United States	2,656	30	55
Western Canada	85	—20	—42

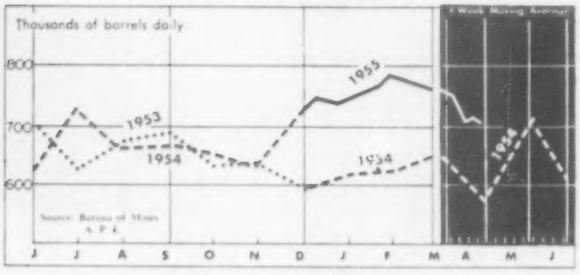
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 30, 1955

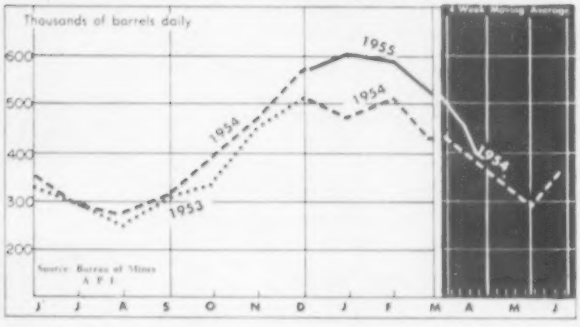
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	0	0	2	11,301	35	39	0	0	0	2	2	0	0	0	34	34
Arkansas	18	11	0	7	56,287	219	204	1	0	0	4	5	13	0	0	58	71
California	61	47	2	12	321,695	842	825	0	0	0	8	8	12	0	2	117	131
Colorado	35	14	1	20	186,041	430	389	3	0	0	13	16	16	0	10	216	242
Illinois	51	25	0	26	126,033	1,147	857	1	0	0	6	7	20	0	1	177	198
Indiana	27	4	0	23	44,148	245	272	1	0	0	22	23	6	0	0	116	122
Kansas	100	35	17	48	354,404	1,636	1,412	1	0	2	21	24	41	1	12	255	309
Kentucky	23	10	3	10	44,263	396	356	0	0	1	1	2	12	0	5	60	77
Louisiana	57	42	3	12	314,620	1,223	1,017	3	2	0	5	10	40	30	9	116	195
North	39	29	1	9	132,504	632	528	2	0	0	4	6	7	3	1	47	58
South	18	13	2	3	182,116	591	489	1	2	0	1	4	33	27	8	69	137
Michigan	8	4	0	4	31,707	166	184	1	0	0	3	4	5	0	0	64	69
Mississippi	17	8	0	9	131,896	152	117	1	0	0	4	5	4	0	0	52	56
Montana	3	0	0	3	23,208	98	87	0	0	0	3	3	1	0	1	31	33
Nebraska	12	6	0	6	72,717	202	111	0	0	0	1	1	14	0	0	78	92
New Mexico	32	19	11	2	126,646	429	379	0	0	0	1	1	14	1	3	32	50
Northwest	10	0	10	0	30,807	109	122	0	0	0	0	0	1	0	3	8	12
Southeast	22	19	1	2	95,839	320	257	0	0	0	1	1	13	1	0	24	38
North Dakota	3	1	0	2	25,993	69	76	0	0	0	1	1	0	0	0	12	12
Ohio	26	12	10	4	65,383	340	365	0	0	0	0	0	1	0	2	9	12
Oklahoma	184	112	3	*69	594,184	2,805	3,003	5	0	0	12	17	47	7	14	205	273
Pennsylvania-New York	24	9	6	*9	56,004	490	799	0	0	0	0	0	0	0	5	3	8
Texas	371	216	9	146	1,606,197	6,351	5,863	12	7	2	86	107	248	38	45	1,332	1,663
Southwest (1 & 4)	54	29	1	24	194,226	1,018	834	1	1	1	17	20	35	10	16	257	318
Gulf Coast (2 & 3)	44	18	4	22	296,681	847	865	0	4	0	12	16	28	23	16	208	275
East (5 & 6)	11	5	2	4	58,100	319	291	0	1	0	2	3	11	2	1	105	119
North Central (7-B & 9)	142	79	1	62	416,262	2,215	2,245	8	0	1	35	44	123	0	2	511	636
West (7-C & 8)	109	76	1	32	600,270	1,628	1,330	3	1	0	19	23	49	1	6	245	301
Panhandle (10)	11	9	0	2	40,658	324	298	0	0	0	1	1	2	2	4	6	14
Utah	2	0	0	2	3,255	21	22	0	0	0	1	1	2	0	2	13	17
West Virginia	13	3	6	4	28,700	193	180	0	0	0	0	0	0	0	3	8	11
Wyoming	16	9	0	7	70,808	257	485	0	0	0	2	2	6	0	3	47	56
Miscellaneous	0	0	0	0	0	15	76	0	0	0	0	0	0	0	0	13	13
Total United States	**1,085**	587	71	427	4,295,490	17,761	17,118	29	9	5	196	**239**	502	77	117	3,048	3,744
Total previous week	1,079	616	81	382	4,582,334			33	9	14	193	249	473	68	112	2,852	3,505
Total May 1, 1955	1,012	579	54	379	3,999,513			21	2	7	177	207	449	50	109	2,841	3,449
Western Canada	34	26	2	6	145,683												

Service wells included: *8.

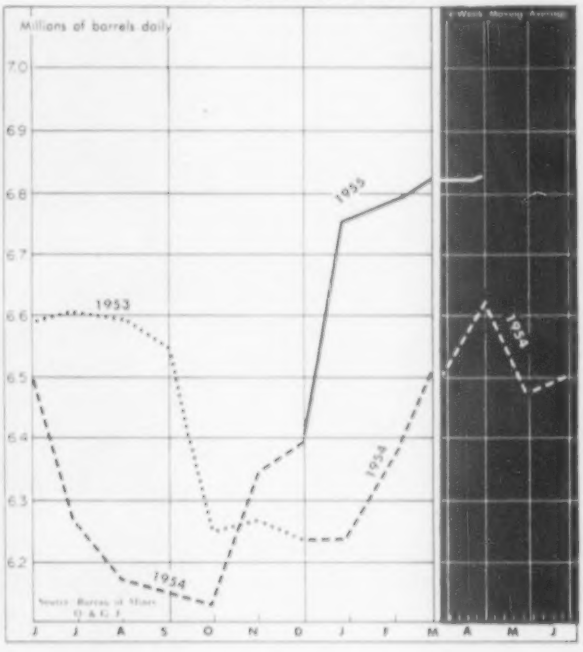
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE OIL PRODUCTION

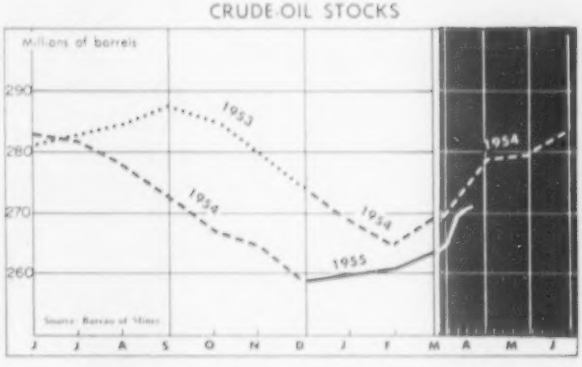


DAILY AVERAGE PRODUCTION FOR WEEK

	April 30			April 23
	Crude oil	Lease condensate	Total	total
Alabama	4,200		4,200	4,100
Arkansas	75,200	450	75,650	73,450
California	975,700		975,700	974,800
Colorado	141,300		141,300	139,800
Eastern	46,500		46,500	46,500
Florida	1,325		1,325	1,325
Illinois	221,400		221,400	219,000
Indiana	27,900		27,900	27,700
Kansas	328,400		328,400	329,600
Kentucky	39,700		39,700	38,400
Louisiana	668,850	54,300	723,150	722,200
North	111,850	2,950	114,800	113,850
South	557,000	51,350	608,350	608,350
Michigan	31,100		31,100	33,100
Mississippi	90,800	5,050	95,850	95,850
Montana	43,800		43,800	43,300
Nebraska	29,700		29,700	29,000
New Mexico	226,025	4,400	230,425	230,525
North Dakota	28,800		28,800	30,700
Oklahoma	557,200		557,200	562,700
Texas	2,893,400	50,500	2,943,900	2,943,900
Dist. 1	54,000	575	54,575	54,575
Dist. 2	150,700	8,100	158,800	158,800
Dist. 3	445,000	23,000	468,000	468,000
Dist. 4	244,000	5,500	249,500	249,500
Dist. 5	47,000	500	47,500	47,500
Dist. 6	124,800	5,400	130,200	130,200
East Texas field	231,200		231,200	231,200
Dist. 7-B	141,000	50	141,050	141,050
Dist. 7-C	195,000	4,500	199,500	199,500
Dist. 8	966,700	2,000	968,700	968,700
Dist. 9	207,000	750	207,750	207,750
Dist. 10	87,000	125	87,125	87,125
Utah	6,200		6,200	6,100
Wyoming	286,700		286,700	284,500
Others	‡400		‡400	500
Total U. S.	6,724,600	114,700	**6,839,300**	6,837,050
Change from previous week, up			**2,250**	
Canada	†257,025		†257,025	†291,175
Total U. S. production January 1-April 30				811,742,175 bbl.
Same period last year (crude plus cond.)				*772,198,060 bbl.

*Includes 12,498,075 bbl. condensate. †Week ended previous Monday. ‡S.D. 100, Nev. 300.

CRUDE-OIL STOCKS

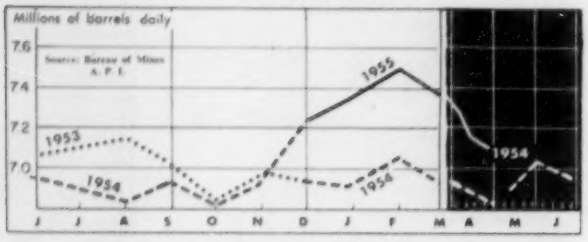


CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

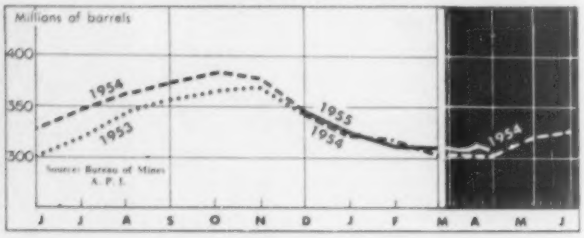
	Apr. 23, '55	Apr. 16, '55	Apr. 24, '54
Pennsylvania Grade	2,874	2,820	3,005
Other Appalachian	2,124	2,216	1,716
Illinois, Indiana, Michigan	11,069	10,814	12,254
Nebraska, North Dakota	2,525	2,374	(‡)
Kansas	8,575	8,591	9,557
Oklahoma	25,402	24,764	26,471
Arkansas	3,050	2,991	3,497
Louisiana	15,526	15,343	15,717
North	2,522	2,500	2,481
South	13,004	12,843	13,236
Mississippi	2,894	2,931	3,430
New Mexico	8,717	8,602	7,655
Texas	125,747	124,502	123,034
East Texas proper	10,140	10,167	10,808
West Texas	55,691	55,339	54,130
Texas Gulf	25,325	24,812	25,732
Other Texas	34,591	34,184	32,364
Wyoming	15,074	14,988	14,088
Other Rocky Mountain	5,608	5,663	3,786
California	32,453	32,527	34,113
Foreign	†11,143	12,299	11,324
Total	272,781	271,425	269,647

*Bureau of Mines. †Includes 2,482,000 bbl. in California. ‡Included with Kansas.

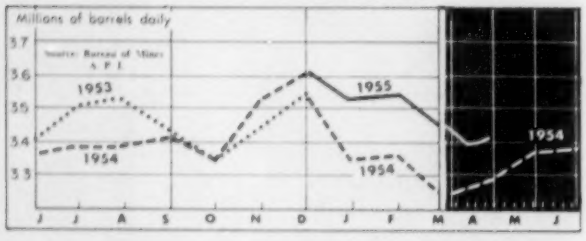
REFINERY RUNS



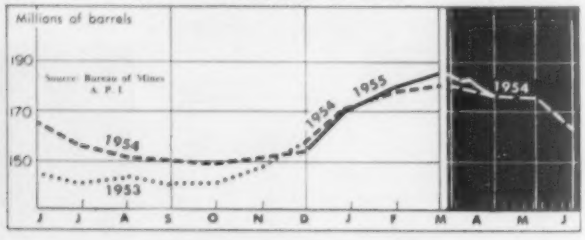
FOUR-PRODUCT STOCKS



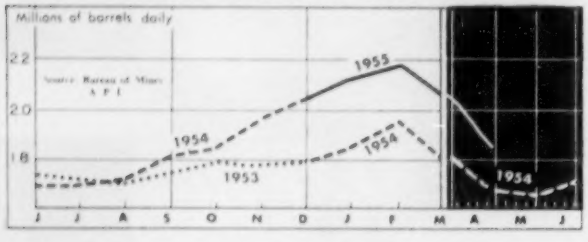
GASOLINE PRODUCTION



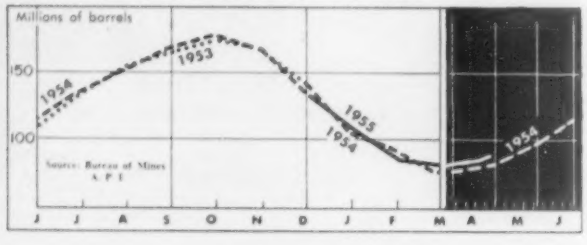
GASOLINE STOCKS



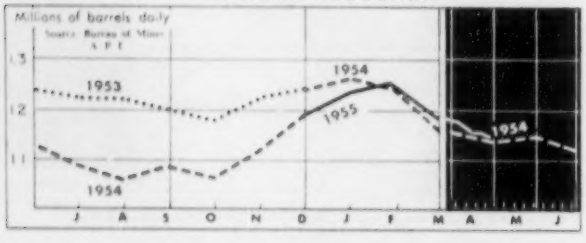
MIDDLE-DISTILLATE PRODUCTION



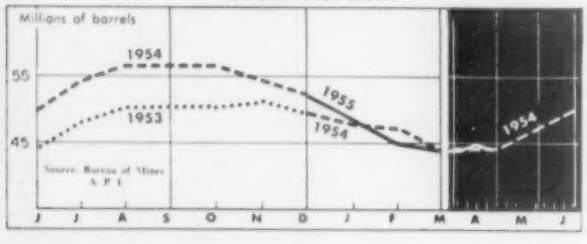
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, APRIL 29

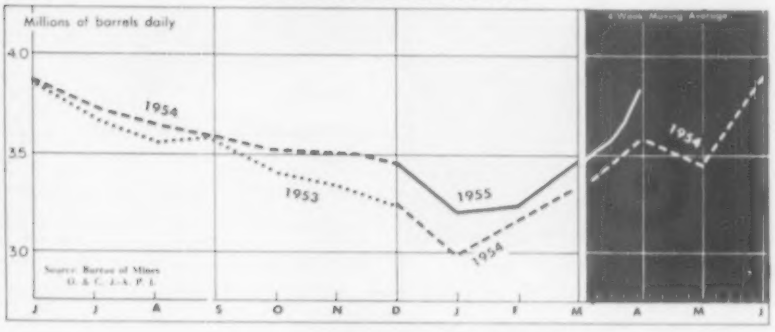
(Excludes all oil-fuel components)

(Thousands of barrels)

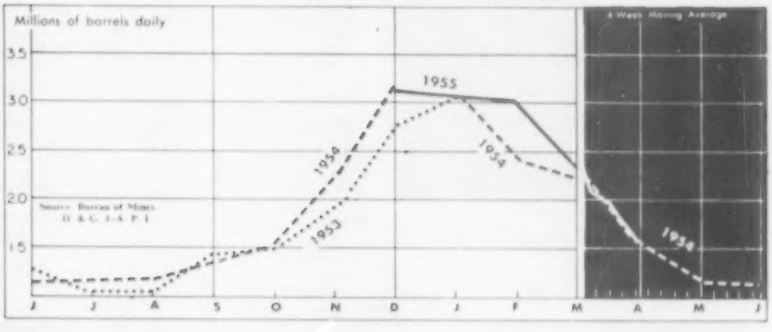
District—	Daily avg. runs	Daily average production— Gaso.*	Kero.	Dist.	Resid.	Stocks‡— Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1954— Daily avg. runs	Daily average production— Gaso.*	Kero.	Dist.	Resid.
East Coast	977	408.2	26.0	223.0	205.9	37,344	8,936	23,280	7,813	996	415.8	35.5	228.7	197.6
Appalachian:														
District 1	99	42.6	3.6	22.3	7.3	5,161	485	1,573	378	99	35.5	4.8	20.1	9.6
District 2	89	46.0	3.3	13.7	13.4	2,682	345	594	108	81	43.5	3.5	16.4	11.6
Ind., Ill., Mo.	1,323	678.4	67.4	250.4	151.3	37,569	4,479	11,303	3,492	1,243	654.3	75.4	218.1	163.2
Okla., Kans., Mo.	625	325.1	15.4	138.3	40.0	17,444	950	7,225	971	569	331.3	15.1	125.6	42.3
Inland Texas	266	183.4	11.3	41.3	18.7	6,745	374	1,176	1,302	249	181.6	10.6	49.8	25.4
Texas Gulf Coast	1,713	815.2	92.3	408.6	248.9	25,078	2,429	7,183	3,909	1,690	813.3	107.8	365.4	239.5
La. Gulf Coast	646	343.1	58.3	146.7	26.0	10,726	1,691	3,869	1,311	548	260.5	52.9	133.4	45.7
N. La. and Ark.	85	33.0	9.3	18.8	6.0	4,152	781	1,236	91	83	30.7	7.5	19.9	5.9
Rocky Mountain:														
New Mexico	20	11.4	1.0	3.0	2.9	177	.....	81	35	17	11.0	0.7	2.9	2.3
Other Rocky Mtn.	231	97.3	3.5	58.6	33.4	7,840	229	1,932	708	211	108.1	2.8	51.8	36.0
California	1,085	459.0	12.3	178.3	359.9	21,841	313	8,183	23,769	1,025	412.2	5.6	141.8	361.4
Apr. 29, 1955	7,159	3,442.7	303.7	1,503.0	1,113.7	176,759	21,012	67,635	43,887	6,811	3,297.8	322.2	1,373.9	1,140.5
Apr. 22, 1955	7,099	3,424.9	321.4	1,483.1	1,143.6	179,741	20,429	65,678	44,619	.....	.....	.....	.....	.....
Apr. 30, 1954	6,675	3,223.9	314.1	1,295.3	1,131.1	177,058	19,680	61,405	44,147	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

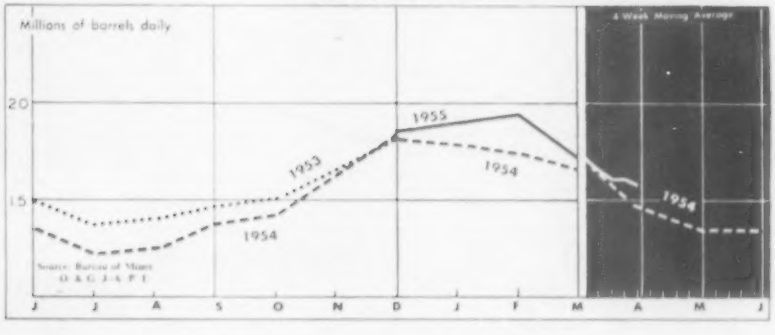
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of May 4, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.75-11.25	11.25-12	10.25-10.75
Premium gasoline	12-12.5	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.5-9.75	10.05	9.0
No. 2 straw fuel oil	8.75-9.0	9.3	8.5
No. 6 residual	$1.60-1.65	$2.35-2.45	$1.95-2.00

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.5	4.0	4.25
Grade 18-55	5.4	4.9	5.15

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Net prices for heating oils on the East Coast were cut with the start of summer-fill programs. Gulf Coast suppliers had cut prices earlier. Gasoline prices are up in the Rocky Mountain area, and a raise is expected for tank-wagon prices in North Central states. Further Group 3 spot gains depend on the tank-wagon market.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four wks. ended 4-29-55	3,412	3,835
February 1955	3,655	3,243
March 1954	3,261	3,331
April 1954	3,298	3,547
Middle distillate:		
Four wks. ended 4-29-55	1,847	1,570
February 1955	2,221	3,036
March 1954	1,811	2,235
April 1954	1,696	1,592
Residual fuel:		
Four wks. ended 4-29-55	1,147	1,574
February 1955	1,239	1,956
March 1954	1,169	1,664
April 1954	1,141	1,479

SUPPLY AND DEMAND*

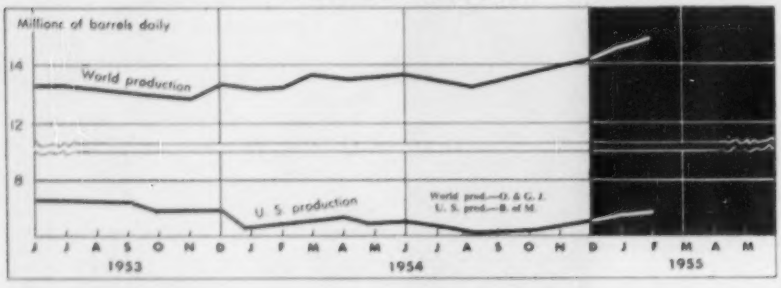
(Thousands of barrels daily)

	Feb. 1955	Jan. 1955	Feb. 1954
Domestic demand	**9,202**	**8,977**	**8,109**
Gasoline	3,159	3,110	3,079
Kerosine	536	551	453
Distillate	2,447	2,380	1,883
Residual	1,835	1,803	1,667
Jet fuel	156	126	124
Lubricants	105	103	97
L.P.G.	452	434	342
Other products	474	436	442
Crude loss	39	34	22
Exports	**366**	**324**	**356**
Gasoline	83	82	103
Kerosine	16	5	24
Distillate	38	64	53
Residual	121	105	75
Jet fuel			
Lubricants	41	30	48
L.P.G.	13	13	12
Other products	19	13	13
Crude	35	12	28
Total demand	**9,568**	**9,301**	**8,465**
Gasoline	3,242	3,192	3,182
Kerosine	552	556	477
Distillate	2,485	2,444	1,936
Residual	1,956	1,908	1,742
Jet fuel	156	126	124
Lubricants	145	133	145
L.P.G.	465	447	354
Other products	493	449	455
Crude exp. and loss	74	46	50
Stock change	**—602**	**—444**	**—250**
Crude	—55	57	—140
Products	—547	—501	—110
New supply	**8,966**	**8,857**	**8,215**
Imports	**1,378**	**1,348**	**1,129**
Crude	751	739	621
Products	627	609	508
Production	**7,588**	**7,509**	**7,085**
Crude	6,836	6,761	6,379
Nat. gasoline, etc.	752	748	706
Runs to stills	**7,549**	**7,379**	**7,068**

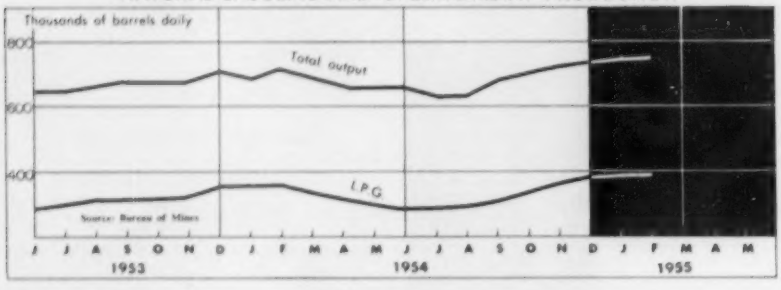
*Bureau of Mines.

(The schedule of selected crude prices appeared on page 198 of April 25 issue and will be printed again next week.)

CRUDE OIL PRODUCTION



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



PRODUCTION AT NATURAL-GASOLINE AND CYCLING PLANTS

(Thousands of barrels daily)

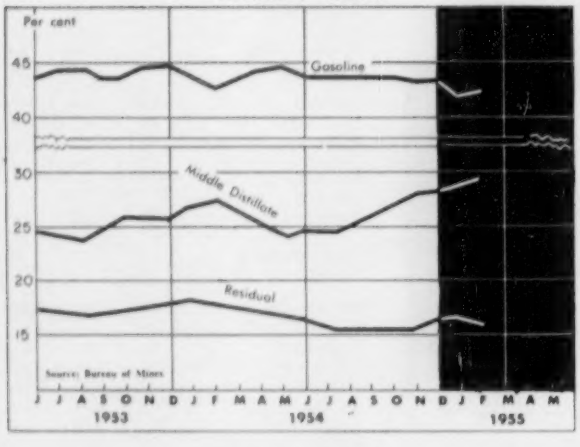
Month—	L.P.G.	Total
February 1955	390	751
January 1955	387	746
December 1954	372	733
June 1954	299	660
February 1954	356	705

CRUDE PRODUCTION

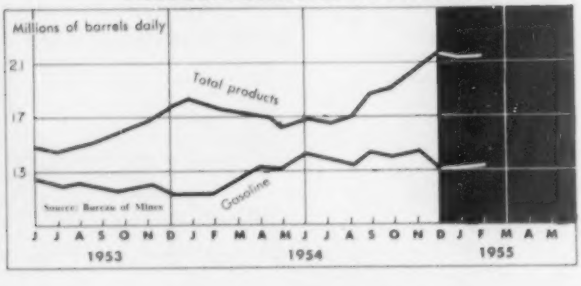
(Thousands of barrels daily)

Month—	U. S.	World
February 1955	6,835	14,902
January 1955	6,761	14,633
December 1954	6,394	14,277
June 1954	6,500	13,674
February 1954	6,379	13,373

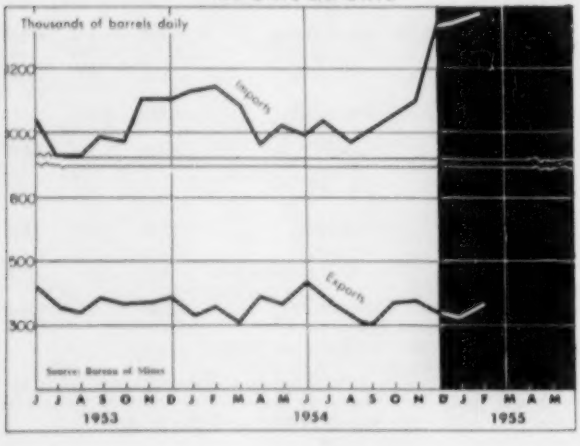
REFINERY YIELDS



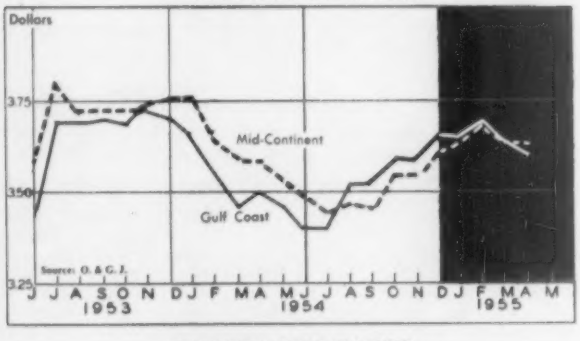
PRODUCTS DELIVERED BY PIPELINE



IMPORTS-EXPORTS



REFINERY REALIZATION



REFINERY REALIZATION

	Apr.* 1955	Mar.* 1955	Feb. 1955	Apr. 1954
Mid-Continent	$3.63	$3.64	$3.66	$3.58
Gulf Coast	3.60	3.64	3.67	3.50

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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FOR SALE EQUIPMENT

N-4 BREWSTER Single Drum Drawworks with one WAK Waukesha Engine—Less than 3 years old—Excellent condition—$11,000.00—Contact Dick Schriber, Iverson Supply Company, Phone 7-2349, Odessa, Texas.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply, Tulsa.

FAILING 2500 Trailer mounted. Also Failing 1500 Truck mounted. Both rigs complete with drill pipe, winch trucks, and tools. For inventory of equipment, and price, write M & G Drilling Co., P. O. Box 42, Guymon, Okla.

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted—max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 122—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE

Three complete drilling rigs, depth range 4000 Ft. to 16,000 Ft., trucks, cars, and tool yard with dwellings. Rigs now operating in West Texas.

CALL 3-3552 OR 4-8145,
MIDLAND, TEXAS.

USED EQUIPMENT

#527—Franks Model 44-TM, Single Drum, Truck Mounted Servicing Unit, 8x10x50' Single Pole Mast, Mounted on FWD Truck.
#526—Franks Model E.T. Single Drum Servicing Unit, 8x10x62' Single Pole Mast, Mounted on 1941 R8-F International Truck.
#526—Franks Super East Texas Double Clutch, Single Drum, Mounted upon KS-11 International Truck. No Mast.
#541—Franks Model ET Single Drum with 8x10x62-ft. Mast, Mounted upon 1948 Model K8 International Truck.

#517—Type 3 O.C.S. Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.
#525—50/60 Idece Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.
#533—Cardwell KL Double Drum Spudder with 60 ft. derrick.

Write, Wire or Call

FRANKS MFG. CORPORATION
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE: Nearly new S 33 Walker-Neer Spudder, Box H-702, The Oil and Gas Journal, Tulsa, Oklahoma.

CORE DRILLS, SPUDDERS, ROTARIES: New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

FOR SALE: Surplus Walworth LimiTorque Motor Control Valves, 4" thru 18". Details furnished on request. Write, wire or phone Purchasing Agent, Texas City Refining, Inc., P. O. Box 1271, Texas City, Texas. Ph. 5-4451.

FOR SALE

1 Caterpillar generator, A.C., 15 K.W.
1 Century generator, D.C., 10 K.W.
1 General Electric generator, D.C., 10 K.W.
1 Westinghouse, D.C., 10 K.W., generator.
1 Kohler electric plant, D.C., 1½ K.W., 4 cylinder.
1 Kohler electric plant, D.C., 5 K.W., 4 cylinder.
1 Kohler electric plant, 5 K.W., Waukesha motor, F.C.-140.

All in excellent condition, may be seen at Makin Yard, Hobbs, New Mexico, or call 3-4062 or 3-3141.

MAKIN DRILLING COMPANY
P. O. BOX 1628
HOBBS, NEW MEXICO

FOR SALE AT TREMENDOUS SAVINGS TO USERS OR DEALERS, THE ITEMS BELOW ARE NEW, PRIME, DOMESTIC MANUFACTURE,

Sell All or Part

200 ea. 16" WN, 300#, Sch. 40 Flanges, RF
125 ea. 24" WN, 300#, Sch. X Strong Flanges, RF
6 ea. 24" Blind, RF, Ser. 30
42 ea. 24" FS Orif. RF, Ser. 30, SO, Sch. 30
9 pr. 24" FS Orif. RF, Ser. 30, WN, Sch. 30
544 ea. 2" WN 300# RF, Sch. 80
354 ea. 6" WN 300# RF, Sch. 80
3000 ea. 2" Rola Grip Couplings
2000 ft. 14" OD x ⅜" wall, new, seamless A53 plain end, bevelled for welding
225 ft. 14" OD x ½" wall, new, seamless A53, p.e.
400 ft. 12¾" OD x 1" wall, new seamless, A106, p.e.
100 ft. 10¾" OD x 1" wall, new, seamless, A53

Write, wire or call

Baron Iron & Equipment Co.
722 Oliver St. N. W., Atlanta, Ga.,
Alwood 9721

FOR SALE EQUIPMENT

FOR SALE—At Oklahoma City warehouse one 2" x 3" Gaso Fig. 3364 Horiz. Triplex Plunger Pump fitted for salt water service, driven by 5 HP 3 phase geared motor. Used approximately 18 months. Price $750.00. Contact T. P. Mace, Oklahoma City Warehouse, or Cities Service Oil, Patridge, Bartlesville, Oklahoma.

AIRCRAFT PARTS & REPAIRS
Mr. Aircraft Owner: Take advantage of our extra special service and vast inventories of Parts, ENGINES, PROPELLERS, TIRES and Supplies. Domestic and Foreign shipments. C A A approved repair station No. 3846.

VESTCO
Dept. L, Box 5306 T A
Denver 17, Colo.

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

USED DRILLING RIGS COMPLETE

1—250 Bethlehem Draw Works with two 225 HP LeRoi compounded engines, 21" Bethlehem Rotary and 7½x14 Pump. 129 ft. Moore Jack Knife Derrick with 6 ft. substructure 150 ton BJ Block and Hook.
5200 ft. 4½" Full Hole Drill Pipe, Hughes Joints unitized 6-4-6 Water Pump with U6 International Engine Rig complete with Light Plant, Shale Shaker, Steel Pipe Racks, two Tool Houses, Tongs, small tools, Drilling Line, Hose, etc. Located East Texas.
1—National 50A Rig Complete with two 325 HP Superior Gas Engines, Lee C. Moore Derrick.
8,000 ft. 4½" Drill Pipe—Rig 2 years old. Located West Texas.
1—National 50 Rig Complete with 3 NKU Waukesha engines, stand by pump, steel slush pits, 8,000 ft. 4½" Drill Pipe, Lee C. Moore Jack Knife Derrick, Heavy Blow-out preventors—Rig 5 years old. Located West Texas.

WRITE, WIRE OR CALL—

Southern Oilfield Material Company
505 N. Ervay St.
Dallas, Texas
RIverside-1073

FOR SALE EQUIPMENT

FOR SALE: ENGINE—166 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa. Phone 4-9700.

FOR SALE—In Madison, Kansas district 3 Model GB Superior 2 cylinder vertical gas engines, 7½" x 8" with clutch, and 7 Model MC Weber 7½" x 9" DO. $350.00 each. These have been operating geared pumping units supplying water for waterflood. Cities Service Oil. Patridge, Bartlesville.

NEW—10¾" O.D.
Spiral Welded

PIPE

4,000 Ft. 28 Lbs. per Ft.—40' Lengths. Immediate shipment—subject to prior sale.

WRITE—WIRE—PHONE

BROWN-STRAUSS CORP.
1546 Guinotte Kansas City, Mo.
Phone HA 1000

NEW PIPE

1000 ft. 26" O.D. .188 wall 40' lengths 51.69 pounds per foot.

4000 feet 10¾" O.D. 40' lengths, 28 pounds per foot.

New spiral weld below warehouse price. Immediate shipment—subject to prior sale.

Write—Wire—Phone

BROWN-STRAUSS Corporation
1546 Guinotte — Kansas City, Mo.
Phone HA 1000

ATTENTION OIL INDUSTRY
(Operators, Producers and Drillers)
FOR SALE
$100,000.00 Inventory Drilling Tools
At 35% OFF
(All or Part)

REED CORE KINGS
Cutter Heads and Core Catchers
Sizes from 5⅞" to 8½" both Hard and Soft formations for K-500 to K-675 barrels, complete with K-36A 2 piece Core Catcher.

REED CUTTERS
(For Wire Line Coring)
Sizes from 7⅝" to 9⅞", both Hard and Soft formations, both Pin and Box connections for all type barrels.

H. C. SMITH, SECURITY AND REED ROLLER ROCK BITS
Sizes from 5⅞" to 9⅞". Soft, Medium and Hard formations. Includes some Jet Bits.

All materials guaranteed factory new, manufactured 1952. No leasing agreement required. Write for detailed list and prices.

B. E. Cowan & Associates
Box 328 Elizabethtown, Kentucky

FOR SALE EQUIPMENT

LINER FOR 5½ casing 1200' new 4" OD seamless 6" couplings 8 round thread 85c. M. J. Regan, Coffeyville, Kansas.

FOR SALE: Medium and small rotary rigs ready to work, priced right for sale. For further information contact, Box H-778, The Oil and Gas Journal, Tulsa, Oklahoma.

WELL DRILLING MACHINE—2 No. 72 Speed Stars, 1 #72 and 1 #83 Stars for sale with or without tools, lines, equip. Compl. rotary attach. & 1500' drill pipe for #72 and #83. Also Cardwell 5000' rotary outfit compl. 5000' 4" drill pipe. JACKSON-MARKUS SUPPLY CO., 3612 E. 26 St., Los Angeles.

FOR SALE: Sullivan rotary truck mounted core and water well drill rig, complete with drill stem, bits, and water truck. H. C. Ford, Jr. Pho. 133 or 210, Granite, Oklahoma.

MAYHEW HEAVY DUTY 1000 Air and Water Combination Drills. Also truck mounted Schram Air Compressors, water trucks and pickups. All equipment guaranteed first class condition. Write P. O. Box 127, Lovington, New Mexico. Phones 8533 or 3791.

FOR SALE

1—Used Model O Cardwell drawworks complete with hydramatic brake, automatic catheads and powered by three 6WAKU Waukesha engines. Lovington, New Mexico.
1—Used Model O Cardwell drawworks complete with hydramatic brake, automatic catheads with two engine compound but less the engines. It can be powered with NK or LRO Waukesha engines. This rig is capable of drilling 8000'.
1—Used Wilson Giant drawworks complete with hydramatic brake, automatic catheads and powered by two GMC 671 twin engines. This rig is capable of drilling 7000'.
1—Used Buda engine, Model JL-1335. This engine is capable of pulling a 125 horsepower load satisfactorily.

All equipment in good usable condition and will bear inspection.

For Price and Location
Call or Write

United Supply & Mfg. Company
Drawer 981 — Tulsa, Oklahoma

SAVE MONEY
on
8" LINE PIPE
LAPWELD 8⅝" O.D. 28.55

Very good No. 1 grade, used pipe. Straight 20' single random lengths machine cleaned.
Choice of plain end or T&C. Ideal for oil, water and gas systems, 850 to 900 psi.
Pipe located in Illinois, with low barge, rail and water rates to any part of the world. Priced below market, selling at almost ½ cost of equivalent new pipe.
Will sell for cash or will finance meritorious propositions.

Brokers and agents protected

REDNEB PIPE CO.
P. O. Box 1798 Shreveport, La.
Phone 2-3276

FOR SALE EQUIPMENT

8⅝ PIPE 28.55# with collar & P.E. $1.00; also 25 miles of P.E. beveled Rg 3. Ten miles 6⅝ P.E. 19# 75 Cents. R. L. Griffin, Box 2373, Phone 50-0848, Tulsa.

FOR SALE—At Madison, Kansas, a large number of 250 bbl. and smaller wood oil storage tanks suitable for same use or for water in flooding. Can be moved as is. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

LIQUIDATION

5—600 HP IR Type KVG Gas Engine Driven 2 Stage Compressors (1942).
1—660 HP IR Type KVG Gas Engine Driven 2 Stage Compressor (1952).
$50,000 New Spare Parts for Above.
2—IR Starting Air Compressors, Model 25c, Type 40, 265#, 67.6 cfm.

LIQUIDATION LEVELLAND, TEX.

TOWERS: 6'x58' chrome-lined (1951) 6'6"x65', 6'x27', 5'x27', 42"x49', 30"x38'.
HEAT EXCHANGERS: (2) 800 sq. ft. (675# 800° F.) Steel.
VESSELS: 3'10"x38', 325#, 950° F.; 5'3"x38'6" (90# 845° F.) chrome lined.
PUMPS: BJ5-St. ni.-chr. pump, 2100' hd., 400 gpm.; IR 15x7x14 steam driven comp.
MISCELL.: Steel, chrome, pipe, valves and fittings, etc. NEW.

AT OTHER LOCATIONS

10—1500, 1000, 430, 360 sq. ft. Steel Ht. Exchangers.
5—650, 424, sq. ft. Adm. Ht. Exchangers.
3—RA-8, MA-4 Clark Gas Engines.
6—325# Vessels 10'x35', 7'x30', 4'x40',
3—150# Vessels, 10'x20', 8'x16', 6'x20'.
4—Centrifugal Pumps, 2000 gpm. 90' hd., 60 gpm. 460' hd., motor and turb. driven.

ATMOSPHERIC HEAT EXCHANGERS

8—715 sq. ft., 850 psig, 550° F., S.S.
6—470 sq. ft. 850 psig, 550° F., S.S.
2—715 sq. ft. 75 psig, 300° F., S.S.
12—358 sq. ft. 75 psig, 300° F., S.S.
2—108 sq. ft. 75 psig, 300° F., S.S.
5—715 sq. ft. Admiralty 100 psig, 300° F.

WIRE! 'PHONE! WRITE!

Full Details on Request

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, Locust 1351
Or
2401 Third Ave., New York 51, N. Y., Cypress 2-5703
"We buy from a single item to a complete plant"

EQUIPMENT WANTED

WANTED: Small rotary drill to drill approximately 300 to 500 feet. Box 400, Great Bend, Kansas.

WANTED

Eight inch pipe threading and cutting machine. Landis Heads preferred, for plumbing and heating contractor's shop.

BOX H-761,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

TWO (2) BIG, Nearly New,

3 DRUM HOISTS

FOR SALE

We have two "AMERICAN" Model 250, 3-drum hoists with attached swingers for sale. Powered by Cummins HPS-600 Diesel engines 170 H.P. with Torque Converters. Capacities 25,000# SLP @ 130 FPM to 8000# SLP @ 400 FPM. Location, 1 on West coast, 1 on East coast.

ARROW CONTRS. EQUIP. CO.
4646 S. Kedzie Ave., Chicago, Ill.
FRontier 6-6500

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, and abandoned leases. Gore Oil Field Supplies, Box 1063. Phone 3-6866 or 6-9747, Tulsa, Oklahoma.

WANT TO BUY—Bucyrus-Erie 28L, trailer mounted. No lines or tools. Must be in good condition and priced right. Kirby Oil Industries, Inc., Box 37, Elmwood Station, Omaha, Nebr. Tel. REgent 0600.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2803, Tulsa, Okla. $5.00 cash.

PETROLEUM ENGINEER OR GEOLOGIST

with broad general knowledge of the petroleum industry in East Texas, North Louisiana and South Arkansas to fill position with well established firm in area. State qualifications in detail.

Box H-705, The Oil and Gas Journal, Tulsa, Oklahoma.

STAFFING NEW OIL REFINERY

COMMONWEALTH OIL REFINING CO. INC.

Building complete new refinery near Ponce, Puerto Rico
requires
Experienced Refinery Personnel
Operating Superintendent
Foremen, Stillmen, Operators
Instrument Supervisor, Senior Chemist
Crude Distillation, Houdriflow Cat Cracking, Cat Reforming, Cat Poly, Alkylation, Gas Recovery, Light Oil Treating

Write, giving complete resume to

Commonwealth Oil Refining Co. Inc.

161 East 42 Street
New York 17, N. Y.

HELP WANTED

WANTED: GEOLOGIST and a Petroleum Engineer by major gas transmission firm in the Southwest for evaluation work in Mississippi, North and South Louisiana, and Texas (excluding West Texas). Box 774, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN for employment in division office of aggressive independent oil company. Two to five years' experience required. Location Denver or Billings. Salary commensurate with experience and qualifications. Send detailed personal history, work experience, and choice of location to Box H-777, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER with thorough technical training and background of engineering and operating experience with special emphasis on catalytic and thermal reforming, alkylation and petrochemicals. Send complete record of education, experience, and minimum salary expected. Write Box H-723, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION EXECUTIVE NEEDED

Large integrated oil company has important executive position to fill in Exploration. Applicant must be graduate geologist with at least 15 years of practical oil finding experience. Should also have some administrative experience and ability. Preferable age under 44. Annual salary commensurate with experience and ability will exceed $22,000. Please supply complete resume of qualifications. Correspondence will be handled on confidential basis.

Box H-787, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES SERVICE

PETROLEUM CHEMICALS

B.S. or M.S. Chemist or Chemical Engineer for combination development laboratory and sales service work. 3 - 5 years refinery laboratory or manufacturing experience in light oils required. Will involve some travel with headquarters at Kingsport, Tennessee. Salary open. Send resume to:

SUPERINTENDENT OF PERSONNEL,

Eastman Chemical Products, Inc.

Kingsport, Tennessee

PROJECT ENGINEER

To supervise the design and correlate the engineering, drafting, purchasing and construction of a plant to produce ammonia.

Your reply should include a resume of experience, education and references and be addressed to the Personnel Manager.

J. F. Pritchard & Company

4625 Roanoke Parkway

Kansas City 12, Missouri

HELP WANTED

OIL INDUSTRY Employment Service. Tom Robinson, owner, 405 Tuloma Bldg., Tulsa, Oklahoma. For technical and trained oil industry personnel.

WANTED: Junior Petroleum Reservoir Engineer having 2 or 3 years experience. Location of employment, Tulsa, Oklahoma. Give qualifications, references and salary expected in first reply. Our employees are aware of this ad. All replies will be held confidential. Box H-785, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST

Wanted for position with independent oil company situated in Tulsa. Must be man of mature judgment with at least 5 years practical and successful oil finding experience in exploration and development. Should have administrative ability to organize and supervise company's exploratory activities. Salary will be commensurate with experience and abilities. In replying give complete personal and professional background and references. All applications will be treated in utmost confidence. Personal interviews will be arranged if data furnished meets our requirements. Box H-788, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER, 6 to 8 years experience with emphasis on refinery or petrochemicals. Initial letter application should set out experience in detail, education and salary requirements. Texas location. Box H-748, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED, by young aggressive company, young graduates 21 to 26 years of age, with degree in Geology, Engineering, Math, or Physics, for trainee positions on Seismograph Crew. Plenty of opportunity for aggressive individual. Must have excellent references. Write, giving full particulars, including education and experience. Box H-782, The Oil and Gas Journal, Tulsa, Oklahoma.

Experienced Reservoir Engineer

Anderson-Prichard has an opening in their Oklahoma City office for an engineer having a minimum of two years experience in reservoir work. Applicant should write giving personal history, a brief resume of education and professional experience and salary expected. All applications will be confidential.

Please address Anderson-Prichard Oil Corporation, Liberty Bank Building, Oklahoma City, Oklahoma. Attention: Mr. D. F. Iver, Industrial Relations Department.

REFINERY OPERATOR

TCC UNIT

SAO PAULO, BRAZIL

Extensive experience operating TCC unit. Responsibility will be similar to shift foreman supervising operations & instructing Brazilian personnel in operation of this unit for new 20,000 bpd refinery.
Challenging opportunity. Excellent base salary plus living allowance & production bonus. Family transported to Brazil at our expense.
Interview arranged at our expense on basis of confidential complete chronological resume, including education & employment (names & addresses of employers, dates employed, including classifications & scope of responsibility, type of units operated, salaries received, etc.). Airmail data to

PERSONNEL DEPARTMENT:

HYDROCARBON RESEARCH, INC.

115 Broadway New York 6, N. Y.

WANTED

SETTLED OIL production wanted by independent operator direct from producer. P. O. Box 852, Oklahoma City, Oklahoma.

SITUATIONS WANTED

GEOLOGIST, Research, M.S., married, age 36, eight years responsible experience. Details furnished upon request. Box H-764, The Oil and Gas Journal, Tulsa, Oklahoma.

CPA, University honor graduate, 33, family—diversified experience in public accounting, heavy in oil and gas taxation, concentrated private experience in refinery, production, and pipeline accounting seeks challenging position as controller, assistant controller or auditor. Available in sixty to ninety days. Box H-780, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 28, experienced in all phases of oil and gas industry, including exploration, exploitation, leasing, deals and farmouts. Present managerial position with major company. Desires work with independent company or financially able individuals interested in oil, gas, uranium exploration in Rocky Mountains. Box H-752, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 27, married, desires position in Rocky Mountain area with active independent. 4 years drilling, production, workover, evaluation and reservoir experience in Oklahoma and Texas. Box H-773, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, D.Sc., 33, surface and subsurface exploration, desires attractive foreign assignment. Box H-765, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL MAP, Engineering Draftsman Major Oil Co. and Government Experience. Desires farm-out work only. Maps, Well logs, Engineering Drgs., Bulletin lettering. Lois Caldwell, 1031 No. Quaker, Ph. 3-0488, Tulsa.

PETROLEUM ENGINEER, Masters degree, 30, married, family, seven years Latin America. Workovers, well completions, reservoir studies, water and gas injection. Employed. Box H-786, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY MAINTENANCE ENGINEER, equipment inspector. Over 7 years experience, incl. 4 years foreign, working with equipment in many phases of refinery operation. Desire oil company or refinery construction work. Graduate engineer. Speak Spanish. Will consider foreign employment. Box H-784, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 6 years South Texas experience desires new affiliation. Box H-791, The Oil and Gas Journal, Tulsa, Oklahoma.

RESPONSIBLE position desired Exploration, Land, or related fields. Geophysicist, 30, Engineering Degree, 8½ years interpretation, 3½ Party Chief, Major Oil Co. Box H-766, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

STRIP LOG CABINETS

MORE LOGS ARE FILED in Kraftbilt Strip Log Cabinets than all others combined. Loaded drawers glide smoothly on roller bearings. Three drawers per section, add sections as needed. Built to last a lifetime! Send for new Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A. Tulsa 1, Oklahoma.

BUSINESS OPPORTUNITIES

ASPHALT—Consulting service on manufacture, paving, roofing asphalts and specialties; formulation, applications, Rheology and highway engineering. Box H-759, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Someone to Manufacture, and Sell, a New Pipe Line Valve, recently designed and developed to meet the increasing requirements, for simplicity, efficiency, and positive sealing. Write P. O. Box 404, San Marcos, Texas.

PETROLEUM SERVICE MANAGEMENT COMPANY, INC.
Commerce Building, Phone 2-9621. Abilene, Texas
Purchasing and management of proven oil and gas properties.
Representing clientele with assets over $200,000,000.
Will accept exclusive listings only.

ROYALTIES

OFFERING AND BUYING Choice Oil and Gas Income Royalties, Oil Properties, Leases and Royalties ahead of drilling. Small Buyers Solicited. A. S. Berry, P. O. Box 1363, Tulsa, Oklahoma.

PIPELINES ANNOUNCED: Projected pipelines indicate increasing action in central Williston Basin, where we specialize in royalties in major company blocks. For informative material, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Mont.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

LEASE AND DRILLING BLOCKS

CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Investments.

KANSAS WATER FLOOD
1500 Acres near Chanute, 6 wells, pumps, tanks, and other equipment, 600 feet depth. Turn it over for development, or sell reasonable. Owner, Box H-789, The Oil and Gas Journal, Tulsa, Oklahoma.

AM LOOKING for proven locations to drill this year on a fair basis. If you have a drilling commitment that is proven I would like to hear from you. Am not interested in buying production nor wildcatting but am interested in substantial program with my own money on proven stuff, preferably less than 3500 feet. Box H-790, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

NOTICE CAPITOL INVESTORS: 320 acres of oil and gas leases with eight producing wells, 200 barrels per day at El Dorado, Kansas. Price $400,000. Priolo Investment Co., 2300 C West 6th, Amarillo, Texas.

WILL PAY CASH for shallow production, acreage, Kansas and Oklahoma. Box H-783, The Oil and Gas Journal, Tulsa, Oklahoma.

¾ DRILLING ASSIGNMENT off-setting Multiple Wilcox Sands, Tyler County, Texas. No cash. Prince Angelloz, 3008 Central, Port Arthur, Texas.

LEASES ROYALTIES
Producing and Nonproducing Bought and Sold—Any Area
Inquiries Invited
B. D. BUCKLEY
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EQUIPMENT MEN

Thornhill-Craver Adds Three to Field Sales Staff

Thornhill-Craver Co. of Houston has added three men to its sales staff. Al Mohle, formerly of Boeing Aircraft and Brown & Root, is a new member of pipeline products sales division. Mohle's office is in the Houston headquarters. J. S. (Jim) Diggles has joined the oil-field sales staff, and is working out of Long-

AL MOHLE

J. S. DIGGLES

FULLER ROGERS

view in the East Texas district. He was formerly with Otis Pressure Control.

Fuller Rogers also joined the oil-field sales staff. He was formerly with Mid-Continent Supply Co. and Iverson Supply Co. Rogers will make his headquarters in Roswell, N. M.

L-O-F Glass Fibers Co. Announces New Directors

The new L-O-F Glass Fibers Co., recently formed by the merger of Glass Fibers, Inc., into the former Libbey-Owens-Ford subsidiary, has officially begun operations.

New board chairman is George P. MacNichol, Jr., who is also president of Libbey-Owens-Ford Glass Co. Other members of the new board are: Randolph H. Barnard, who is president and general manager of the new L-O-F Glass Fibers Co.; John D. Biggers, who is chairman of the board of Libbey-Owens-Ford Glass Co.; F. E. Cazayoux, who is comptroller and treasurer of Libbey-Owens-Ford and has been with that company since 1927; Thomas A. Collins, who will be vice president and assistant general manager of the new company; Curtis W. Davis, who has been with Libbey-Owens-Ford since 1923 and a director since 1952; J. M. Johns, who will be vice president and director of sales of the new concern; D. Dean McCormick, who had been a director of Glass Fibers Inc., since 1949; and Gordon W. Reed, who had been a director of Glass Fibers since 1946 and chairman of its board since 1948.

J & L Supply Division to Move Tulsa Facilities

The Supply Division of Jones & Laughlin Steel Corp., Tulsa, has announced the purchase of a large tract of land in one of Tulsa's newest industrial sections. A new central office and operating headquarters for the J&L Supply Division will be erected on the land. Present plans are for a building of approximately 100,000 sq. ft. which, in addition to the central office, will house the warehouse operations and the Tulsa oil-field supply store.

J&L Supply Division now operates from offices and headquarters located on Trenton Avenue, where it has been housed in four buildings on about 3½ acres of ground since 1918.

Announcement was made by Rainey Elliott, president of the J&L Supply Division, who stated that their present operations comprise 90 stores located in 18 states and in 3 provinces of western Canada.

J. B. Hughes Elected Hydril Vice President

James B. Hughes of Houston, Tex., was elected vice president of Hydril Co. at the last meeting of the board of directors of that company held in Los Angeles, Calif. After working for a short time as a coredriller and engineer, Hughes joined the staff of the Hydril Co. in Los Angeles, where he worked in the factory and oil fields. In 1941 he was transferred by Hydril to Texas.

Security Moves Executive Offices to Dallas

The executive offices of Security Engineering Division, one of the Dresser Industries, have been moved from Whittier, Calif., to Dallas. Otto Hammer, president of Security, made the announcement.

Temporarily, Security's management will make their headquarters in the Atlantic Building at Dallas pending completion of executive offices now under construction at the Dallas plant.

In announcing the move, Hammer also pointed out that an intensive expansion program is now under way at both Security's Whittier and Dallas plants. New machinery, additional personnel, and an increase in floor space is slated for each plant to meet the growing demands for drilling tools.

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LEGAL

SEALED BIDS will be received until 2:00 P. M. Monday, May 23, 1955, and opened at that time at the Pawnee Sub-Agency office for the leasing of allotted lands located in Kay, Noble, Pawnee and Payne Counties, Oklahoma, for oil and gas mining purposes. For additional information write or telephone Mr. Johnson, Area Field Representative of the Pawnee Sub-Agency Office (Phone 985).

LEGAL

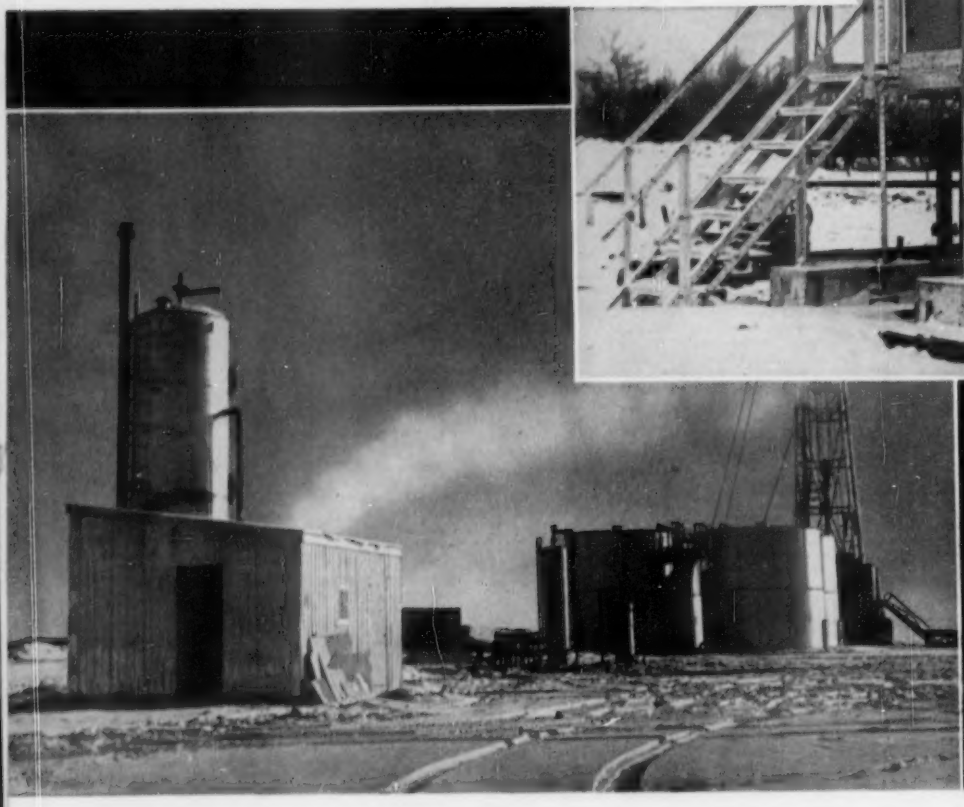
U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Santa Fe, New Mexico. Notice is hereby given that approximately 3,603.88 acres of land in sixteen parcels within the known geologic structures of certain fields in Rio Arriba and San Juan Counties, New Mexico, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, May 24, 1955, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Land Office at Santa Fe, New Mexico. J. A. DeLany, Manager.

LEGAL

SEALED BIDS will be received until 2:00 P. M., Mountain Standard Time, May 25, 1955, and opened at that time in the Office of the Fort Peck Indian Agency, Poplar, Montana, for the leasing of 14,180.70 acres of Tribal land and 52,339.51 acres of allotted Indian land, located in Roosevelt and Valley Counties, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Fort Peck Indian Agency at Poplar, Montana, or telephone, Poplar, 2181.

National

TANK ENGINEERS SOLVE CRUDE HEATING PROBLEMS IN LEDUC FIELD



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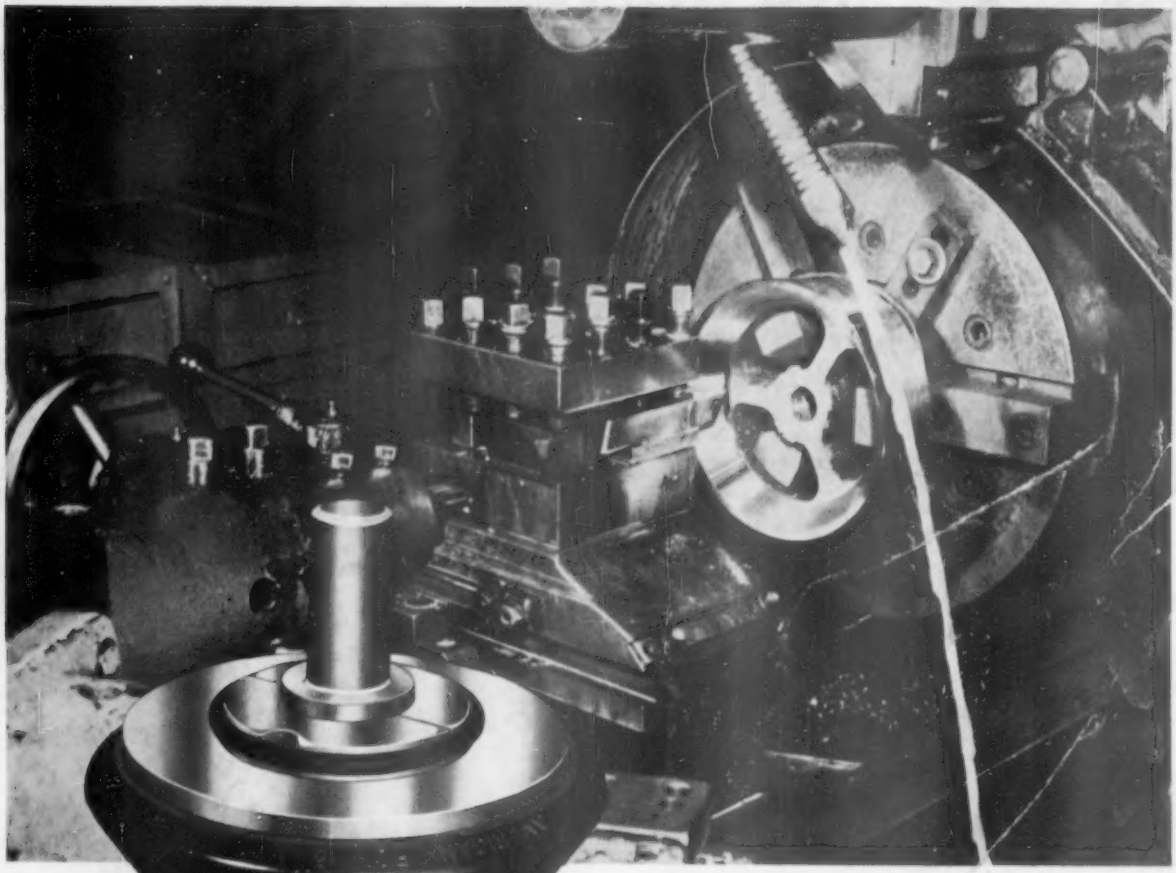

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